MATH for SCIENCE
Conversion Problems ~ Lesson Plans

I. Topic: Conversion Problems ~

II. Goals/Objectives:
- A. Students will understand the relationship between English and metric systems.
- B. Students will learn to convert from one set of units to another set of units within the English system.
- C. Students will learn to convert English units to metric units.
- D. Students will learn to convert metric units to English units.
- E. Students will be able to do one-step conversions.
- F. Students will be able to do multi-step conversions.
- G. Students will be able to convert two unit rate problems to two different rate units.

III. National Education Standards:
- A. Mathematics.
  1. NM-NUM.9-12.1
     Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
  2. NM-ALG.9-12.3
     Use mathematic models to represent and understand quantitative relationships.
  3. NM-ALG.9-12.4
     Analyze change in various contexts.
  4. NM-PROB.PK-12.1
     Build new math knowledge through problem-solving skills.
  5. NM-PROB.PK-12.2
     Solve problems that arise in mathematics and in other contexts.
  6. NM-PROB.PK-12.3
     Apply and adapt a variety of appropriate strategies to solve problems.
  7. NM-PROB.COMM.PK-12.2
     Communicate math thinking coherently and clearly to peers, teachers, and others.
  8. NM-PROB.CONN.PK-12.2
     Understand how mathematic ideas interconnect and build on one another to produce a coherent whole.
  9. NM-PROB.CONN.PK-12.3
     Recognize and apply mathematics in contexts outside of the classroom.
  10. NM-PROB.REP.PK-12.2
      Select, apply, and translate among mathematic representations to solve problems.
- B. Science

  Standard 12 — Level III – Benchmarks 6, 8; Level IV – Benchmark 4

IV. Materials:
- A. Blackboard with colored chalk or whiteboard with colored markers.

B. Overhead projector.
C. Clear projection sheets to make overhead sheets of the "Presentation Notes."
D. "Student Notes" copied for each student.
E. Pencils, colored pencils, & calculators.
F. Conversion Problems Worksheet.
G. Conversion Tables Handout.
H. Metric Equivalents & SI Units Handout.

V. Presentation Outline:
A. Dimensional Analysis
1. Standard or situational equivalents – two fractions.
2. Problem Solving Scheme.
B. One Step Conversions
1. Problem analysis.
2. Examples.
C. Two Step Conversions ~ Type 1
1. Problem analysis.
2. Examples.
D. Two Step Conversions ~ Type 2
1. Problem analysis.
2. Examples.
E. Three Step Conversions
1. Problem analysis.
2. Examples.

VI. Presentation:
This may take two days for students who are not mathematically inclined. If taking two days, cover the material through "Two Step Conversions ~ Type 1" the first day. The second day, begin by reviewing day one and the homework. Then, cover the remaining material in the packet.
A. Use the presentation notes on an overhead projector, or
B. Use the power point presentation.

VII. Conversion Problems Presentation: Student Notes ~
Students are to fill in the blank spaces in their notes during the presentation.

VIII. Handouts:
A. Conversion Tables – English and Metric Equivalents.
B. Metric Equivalents and SI Data.

IX. Independent Practice: Conversion Problems Worksheet ~
A. Homework: #s A: 1- 10; B: 1 – 10; C: 1- 10; D: 1 – 10 due the next day.
B. If taking two days:
1. Day 1 HW: #s A: 1 – 10; B: 1 – 10 due the next day.
2. Day 2 HW: #s C: 1 - 10; D: 1 - 10 due the next day.

X. Evaluation/Assessment: Conversion Problems Quiz ~
Have students take this quiz the day after going over any questions about the entire homework worksheet.

MATH for SCIENCE
Conversion Problems

I. Introduction

A. In science many problems require conversions from one set of units to another. Some people use many proportions to do these conversions. This method can be quite confusing when there are multiple conversions to be done. The most efficient and easiest method to understand is called **dimensional analysis** or **factor-label method**.

B. Dimensional analysis requires students to understand two concepts.

1. All numbers must be used with their units. For example, weight of an object would be 8 g and not just 8.

2. All standard or situational equivalents can be represented by two fractions. The choice depends on what units are originally given in the problem. For example:

1 minute = 60 seconds ⇨ $\frac{1 \text{ minute}}{60 \text{ seconds}}$ or $\frac{60 \text{ seconds}}{1 \text{ minute}}$

1 foot = 12 inches ⇨ $\frac{1 \text{ foot}}{12 \text{ inches}}$ or $\frac{12 \text{ inches}}{1 \text{ foot}}$

1 meter = 100 centimeter ⇨ $\frac{1 \text{ meter}}{100 \text{ cm}}$ or $\frac{100 \text{ cm}}{1 \text{ meter}}$

3. This method can be used for problems that are one step, two steps, three steps, and more. It can accommodate any number of conversions as one linear problem, moving one step at a time. Each step directs the set-up for the next step until the goal units are reached.

4. Problem-Solving Scheme

Given Data x Specific Fractional Equivalent(s) = What You're Looking For

The units in the numerator of the first item (given data) determine the units for the denominator of the next fraction. When these units are the same, they will cancel each other out. This also chooses which one of the two forms of the specific fractional equivalents you will need to use.

C. One Step Conversions

1. How many minutes are in five hours?

Given Data: 5 hrs

Fractional Equivalent:

1 hour = 60 minutes $\frac{1 \text{ hour}}{60 \text{ min}}$ **or** $\frac{60 \text{ min}}{1 \text{ hour}}$

Looking For: # minutes

Given Data x Specific Fractional Equivalent = Looking For

$$5 \text{ hours} \times \frac{60 \text{ min}}{1 \text{ hour}} = 300 \text{ min}$$

Notice how the "hour" units canceled each other out.

2. If a turtle walked 20 yards in one hour, how many inches did he walk in that hour?

Given Data: 20 yards/ 1 hour
Specific Fractional Equivalents:
1 yard = 36 inches $\frac{1 \text{ yard}}{36 \text{ in}}$ or $\frac{36 \text{ in}}{1 \text{ yard}}$
Looking For: # inches/hour

Given Data x Specific Fractional Equivalent = Looking For

$$\frac{20 \text{ yards}}{1 \text{ hr}} \times \frac{36 \text{ inches}}{1 \text{ yard}} = \frac{720 \text{ inches}}{1 \text{ hr}}$$

3. A nugget of gold found in the river weighs 6.5 ounces. How many grams will that weigh?

Given Data: 6.5 oz
Specific Fractional Equivalents:
1 ounce = 28.33 grams $\frac{1 \text{ ounce}}{28.33 \text{ g}}$ or $\frac{28.33 \text{ g}}{1 \text{ ounce}}$
Looking For: # grams

Given Data x Specific Fractional Equivalent = Looking For

$$6.5 \text{ ounces} \times \frac{28.33 \text{ grams}}{1 \text{ ounce}} = 184.145 \text{ grams}$$

D. Two Step Conversions ~ Type 1

Remember the units in the previous numerator will determine which form of the two Fractional Equivalents will be used.

1. Two students were using a computer program for their research data. One of their study observations took 5 hours. Their computer program however, will only let them enter the time in seconds. How many seconds should they enter?

Given Data: 5 hours
Specific Fractional Equivalents:
1 hour = 60 minutes $\frac{1 \text{ hour}}{60 \text{ min}}$ or $\frac{60 \text{ min}}{1 \text{ hour}}$
1 minute = 60 seconds $\frac{1 \text{ min}}{60 \text{ sec}}$ or $\frac{60 \text{ sec}}{1 \text{ min}}$
Looking For: # seconds

Given Data x Specific Fractional Equivalents = Looking For

$$5 \text{ hours} \times \frac{60 \text{ min}}{1 \text{ hour}} \times \frac{60 \text{ sec}}{1 \text{ min}} = 18{,}000 \text{ sec}$$

2. Convert 2,250 grams to # pounds.

Given Data: 2,250 grams

Specific Fractional Equivalents:

1 gram = 0.0353 ounces $\quad \frac{1 \text{ gram}}{0.0353 \text{ oz}}$ or $\frac{0.0353 \text{ oz}}{1 \text{ gram}}$

16 ounces = 1 pound $\quad \frac{16 \text{ oz}}{1 \text{ lb}}$ or $\frac{1 \text{ lb}}{16 \text{ oz}}$

Looking For: # pounds

$$2{,}250 \text{ grams} \times \frac{0.0353 \text{ oz}}{1 \text{ gram}} \times \frac{1 \text{ lb}}{16 \text{ oz}} = 4.964 \text{ lbs}$$

3. Convert 2.5 meters to # inches.

Given Data: 2.5 m

Specific Fractional Equivalents:

1 meter = 3.28 feet $\quad \frac{1 \text{ m}}{3.28 \text{ ft}}$ or $\frac{3.28 \text{ ft}}{1 \text{ m}}$

1 foot = 12 inches $\quad \frac{1 \text{ ft}}{12 \text{ in}}$ or $\frac{12 \text{ in}}{1 \text{ ft}}$

Looking For: # inches

$$2.5 \text{ m} \times \frac{3.28 \text{ ft}}{1 \text{ m}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 98.4 \text{ in}$$

E. Two Step Conversions ~ Type 2

These problems involve converting not just the numerator given, but also the denominator.

1. Do the usual **conversion of the numerator**.
2. Then, **convert the denominator**. To do this, the units in the original denominator determine the units in the later numerator. Thus, by having the same units in the denominator and then in the later numerator, the units once again will cancel each other out.

1. Convert 50 miles/hour to # kilometers/minute.

Given Data: 50 miles/hour

Specific Fractional Equivalents:

1 mile = 1.61 km $\quad \frac{1 \text{ mile}}{1.61 \text{ km}}$ or $\frac{1.61 \text{ km}}{1 \text{ mile}}$

1 hour = 60 min $\quad \frac{1 \text{ hr}}{60 \text{ min}}$ or $\frac{60 \text{ min}}{1 \text{ hr}}$

$$\frac{2.5 \cancel{\text{miles}}}{1 \cancel{\text{hour}}} \times \frac{1.61 \text{ km}}{1 \cancel{\text{mile}}} \times \frac{1 \cancel{\text{hr}}}{60 \text{ min}} = \frac{0.067 \text{ km}}{1 \text{ min}}$$

2. Convert 20 yards/min to # inches/sec.

Given Data: 20 yd/min

Specific Fractional Equivalents:

1 yard = 36 inches $\quad \frac{1 \text{ yd}}{36 \text{ in}}$ or $\frac{36 \text{ in}}{1 \text{ yd}}$

1 minute = 60 seconds $\frac{1\text{ min}}{60\text{ sec}}$ or $\frac{60\text{ sec}}{1\text{ min}}$

Looking For: # inches/second

$$\frac{20\text{ yd}}{1\text{ min}} \times \frac{36\text{ in}}{1\text{ yd}} \times \frac{1\text{ min}}{60\text{ sec}} = \frac{12\text{ in}}{1\text{ sec}}$$

3. Convert 100 ounces/gallon to # grams/liter.

Given Data: 100 oz/gal

Specific Fractional Equivalents:

1 gram = 0.0353 ounces or 1 ounce = 28.33 grams

1 liter = 0.2642 gallons or 1 gallon = 3.785 liters

Looking For: # grams/liter

$$\frac{100\text{ oz}}{1\text{ gal}} \times \frac{1\text{ gram}}{0.0353\text{ oz}} \times \frac{0.2642\text{ gal}}{1\text{ L}} = \frac{748.4\text{ grams}}{1\text{ L}}$$

OR

$$\frac{100\text{ oz}}{1\text{ gal}} \times \frac{28.33\text{ g}}{1\text{ oz}} \times \frac{1\text{ gal}}{3.785\text{ L}} = \frac{748.5\text{ grams}}{1\text{ L}}$$

F. Three Step Conversion Problems

Remember the units in the previous numerator will determine which form of the two Fractional Equivalents will be used.

Some Problems may also include changing the denominator's units, as well. The same sequence of actions would apply: First, change the numerator's units, then change the denominator's units.

1. Convert 3 days to # seconds.

Given Data: 3 days

Specific Fractional Equivalents:

1 day = 24 hours $\frac{1\text{ day}}{24\text{ hrs}}$ or $\frac{24\text{ hrs}}{1\text{ day}}$

1 hour = 60 minutes $\frac{1\text{ hr}}{60\text{ min}}$ or $\frac{60\text{ min}}{1\text{ hr}}$

1 minute = 60 seconds $\frac{1\text{ min}}{60\text{ sec}}$ or $\frac{60\text{ sec}}{1\text{ min}}$

Looking For: # seconds

$$\frac{3\text{ days}}{} \times \frac{24\text{ hrs}}{1\text{ day}} \times \frac{60\text{ min}}{1\text{ hr}} \times \frac{60\text{ sec}}{1\text{ min}} = 25{,}920\text{ seconds}$$

2. Convert 18 kilometers/hour to # meters/second.

Given Data: 18 km/hr

Specific Fractional Equivalents:

1 km = 1,000 m $\frac{1\text{ km}}{1{,}000\text{ m}}$ or $\frac{1{,}000\text{ m}}{1\text{ km}}$

1 hr = 60 min

1 min = 60 sec

Looking For: meters/second

$$\frac{18\ \text{km}}{1\ \text{hr}} \times \frac{1{,}000\ \text{m}}{1\ \text{km}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{1\ \text{min}}{60\ \text{sec}} = \frac{5\ \text{m}}{1\ \text{sec}}$$

3. Convert 9,000 grams/centimeter to # pounds/inch.

Given Data: 9,000 g/cm

Specific Fractional Equivalents:

28.33 g = 1 oz	$\frac{28.33\ \text{g}}{1\ \text{oz}}$	or	$\frac{1\ \text{oz}}{28.33\ \text{g}}$
16 oz = 1 lb	$\frac{16\ \text{oz}}{1\ \text{lb}}$	or	$\frac{1\ \text{lb}}{16\ \text{oz}}$
2.54 cm = 1 in	$\frac{2.54\ \text{cm}}{1\ \text{in}}$	or	$\frac{1\ \text{in}}{2.54\ \text{cm}}$

Looking For: lb/in

$$\frac{9{,}000\ \text{g}}{1\ \text{cm}} \times \frac{1\ \text{oz}}{28.33\ \text{g}} \times \frac{1\ \text{lb}}{16\ \text{oz}} \times \frac{2.54\ \text{cm}}{1\ \text{in}} = \frac{50\ 4\ \text{lb}}{1\ \text{in}}$$

Note for Teachers:

The highlighted areas in the "Presentation" are the areas left blank in the "Student Notes." These highlighted areas act as the grading "key" for the "Student Notes." It is recommended that each word or number the student successfully records on his/her "Notes" sheets be given either one half (0.5) of a point or one point. Giving students points for recording important information encourages them to stay focused during class and helps to ensure that students have complete information to study.

Conversion Problems ~ Student Notes

Name: _____ Date: _____ Grade: _____

II. Introduction ~

A. In science many problems require conversions from one set of _____ to another. Some people use many proportions to do these conversions. This method can be quite confusing when there are multiple conversions to be done. The most efficient and easiest method to understand is called _____ or **factor-label method**.

B. Dimensional analysis requires students to understand _____ concepts.

1. _____ must be used with their _____. For example, weight of an object would be 8 g and not just 8.

2. All standard or situational equivalents can be represented by _____. The choice depends on what units are originally given in the problem. For example:

1 minute = 60 seconds ⇨ $\frac{1 \text{ minute}}{60 \text{ seconds}}$ or $\frac{60 \text{ seconds}}{1 \text{ minute}}$

1 foot = 12 inches ⇨ $\frac{\_\_\_\_\_}{12 \text{ inches}}$ or $\frac{\_\_\_\_\_}{1 \text{ foot}}$

1 meter = 100 centimeter ⇨ _____ or _____

3. This method can be used for problems that are one step, two steps, three steps, and more. It can accommodate any number of _____ as one _____, moving one step at a time. Each step directs the set-up for the _____ until the goal units are reached.

4. Problem-Solving Scheme

Given Data x Specific Fractional Equivalent(s) = What Your Looking For

The units in the numerator of the first item (_____) determine the units for the _____ of the next fraction. When these units are the _____, they will cancel each other out. This also, chooses which one of the two forms of the specific fractional equivalents you will need to use.

C. One Step Conversions

1. How many minutes are in five hours?
Given Data: 5 hrs

Fractional Equivalent:

1 hour = 60 min $\frac{\text{1 hour}}{\text{60 min}}$ **or** $\frac{\text{60 min}}{\text{1 hour}}$

Looking For: # minutes

Given Data x Specific Fractional Equivalent = Looking For

$$5 \text{ hours} \times \frac{60 \text{ min}}{1 \text{ hour}} = 300 \text{ min}$$

Notice how the "hour" units canceled each other out.

.

2. If a turtle walked 20 yards in one hour, how many inches did he walk in that hour?

Given Data: _____

Specific Fractional Equivalents:

1 yard = 36 inches $\frac{\text{\_\_\_\_\_}}{\text{36 in}}$ **or** $\frac{\text{\_\_\_\_\_}}{\text{1 yd}}$

Looking For: _____

Given Data x Specific Fractional Equivalent = Looking For

$$\frac{20 \text{ yards}}{1 \text{ hr}} \times \frac{\text{\_\_\_\_\_}}{1 \text{ yard}} = \frac{\text{\_\_\_\_\_ inches}}{1 \text{ hr}}$$

3. A nugget of gold found in the river weighs 6.5 ounces. How many grams will that weigh?

Given Data: _____

Specific Fractional Equivalents:

1 ounce = 28.33 grams $\frac{\text{\_\_\_\_\_}}{}$ **or** $\frac{\text{\_\_\_\_\_}}{}$

Looking For: _____

Given Data x Specific Fractional Equivalent = Looking For

$$6.5 \text{ ounces} \times \text{\_\_\_\_\_} = \text{\_\_\_\_\_ grams}$$

D. Two Step Conversions ~ Type 1

Remember the units in the previous _____ will determine which form of the two _____ will be used.

1. Two students were using a computer program for their research data. One of their study observations took 5 hours. Their computer program however, will only let them enter the time in seconds. How many seconds should they enter?

Given Data: 5 hours

Specific Fractional Equivalents:

1 hour = 60 minutes $\frac{\text{\_\_\_\_\_}}{}$ **or** $\frac{\text{\_\_\_\_\_}}{}$

1 minute = 60 seconds _____ **or** _____

Looking For: # seconds

Given Data x Specific Fractional Equivalents = Looking For

5 ~~hours~~ x _____. x _____ = _____ sec
1 ~~hour~~

2. Convert 2,250 grams to # pounds.
Given Data: _____
Specific Fractional Equivalents:
1 gram = 0.0353 ounces _____ or _____

16 ounces = 1 pound _____ or _____

Looking For: _____

2,250 grams x _____ x _____ = _____ lbs

3. Convert 2.5 meters to # inches.
Given Data: _____
Specific Fractional Equivalents:
1 meter = 3.28 feet _____ or _____

1 foot = 12 inches _____ or _____

Looking For: _____

2.5 meters x _____ x _____ = _____ inches

E. Two Step Conversions ~ Type 2

These problems involve converting not just the numerator given, but also the denominator.

1. Do the usual **conversion of the numerator**.
2. Then, **convert the denominator**. To do this, the units in the original denominator determine the units in the later numerator. Thus, by having the same units in the denominator and then in the later numerator, the units once again will cancel each other out.

1. Convert 50 miles/hour to # kilometers/minute.
Given Data: 50 miles/hour

Specific Fractional Equivalents:
1 mile = 1.61 km _____ or _____

1 hour = 60 min _____ or _____

$$\frac{2.5\ \text{miles}}{1\ \text{hour}} \times \frac{1.61\ \text{km}}{1\ \text{mile}} \times \frac{1\ \text{hr}}{60\ \text{min}} = \frac{0.067\ \text{km}}{1\ \text{min}}$$

2. Convert 20 yards/minute to # inches/second.

Given Data: _____ yd/min

Specific Fractional Equivalents:

1 yard = 36 inches _____ or _____

1 minute = 60 seconds _____ or _____

Looking For: # inches/second

$$\frac{20\ \text{yd}}{1\ \text{min}} \times \frac{\_\_\_\_\_}{1\ \text{yd}} \times \frac{1\ \text{min}}{} = \frac{\_\_\_\_\_\ \text{in}}{1\ \text{sec}}$$

3. Convert 100 ounces/gallon to # grams/liter.

Given Data: _____

Specific Fractional Equivalents:

1 gram = 0.0353 ounces or 1 ounce = 28.33 grams

1 liter = 0.2642 gallons or 1 gallon = 3.785 liters

Looking For: _____

$$\frac{100\ \text{oz}}{1\ \text{gal}} \times \frac{\_\_\_\_\_}{\text{oz}} \times \frac{\_\_\_\_\_\ \text{gal}}{} = \frac{\_\_\_\_\_\ \text{grams}}{1\ \text{L}}$$

OR

$$\frac{100\ \text{oz}}{1\ \text{gal}} \times \frac{\_\_\_\_\_}{} \times \frac{\_\_\_\_\_}{} = \_\_\_\_\_$$

G. Three Step Conversion Problems

Remember the units in the previous numerator will determine which form of the two Fractional Equivalents will be used.

Some Problems may also include changing the denominator's units, as well. The same sequence of actions would apply: change the numerator's units; then change the denominator's units.

1. Convert 3 days to # seconds.

Given Data: _____

Specific Fractional Equivalents:

1 day = 24 hours _____ or _____

1 hour = 60 minutes _____ or _____

1 minute = 60 seconds _____ or _____

Looking For: _____

$$3\ \text{days} \times \frac{24\ \text{hrs}}{1\ \text{day}} \times \frac{60\ \text{min}}{1\ \text{hr}} \times \frac{60\ \text{sec}}{1\ \text{min}} = \_\_\_\_\_\ \text{sec}$$

2. Convert 18 kilometers/hour to # meters/second.

Given Data: _____

Specific Fractional Equivalents:

1 km = 1,000 m _____ or _____

1 hr = 60 min

1 min = 60 sec

Looking For: _____

$$\frac{18\ \text{km}}{1\ \text{hr}} \times \frac{\_\_\_\_\_}{\_\_\_\_\_} \times \frac{\_\_\_\_\_}{\_\_\_\_\_} \times \frac{\_\_\_\_\_}{\_\_\_\_\_} = \_\_\_\_\_$$

3. Convert 9,000 grams/centimeter to # pounds/inch.

Given Data: _____

Specific Fractional Equivalents:

28.33 g = 1 oz _____ or _____

16 oz = 1 lb _____ or _____

2.54 cm = 1 in _____ or _____

Looking For: _____

$$\frac{9{,}000\ \text{g}}{1\ \text{cm}} \times \frac{\_\_\_\_\_}{\_\_\_\_\_} \times \frac{\_\_\_\_\_}{\_\_\_\_\_} \times \frac{\_\_\_\_\_}{\_\_\_\_\_} = \_\_\_\_\_$$

CONVERSION TABLES

English Units

Mass

1 pound (lb) = 16 ounces (oz)

1 ton = 2,000 pounds

Distance

1 foot = 12 inches

1 yard = 3 feet

1 yard = 36 inches

Volume

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

Metric Units

Mass

1 kilogram = 1,000 grams

1 gram = 1,000 milligrams

Distance

1 kilometer = 1,000 meters

1 meter = 100 centimeters

1 meter = 1,000 millimeters

Volume

1 kiloliter = 1,000 liters

1 liter = 1,000 milliliters

1 millimeter = 1 centimeter^3

1 liter = 1 decimeter^3

English to Metric

Mass

1 ounce (oz) = 28.33 grams (g)

1 pound (lb) = 0.454 kilogram (kg)

Distance

1 inch = 2.54 centimeter (cm)

1 foot = 0.305 meters (m)

1 yard = 0.9145 meters

1 mile = 1.61 kilometers (km)

Volume

1 fluid oz (fl oz) = 29.585 milliliters (ml)

1 gallon (gal) = 3.785 liters (L)

Temperature

Fahrenheit to Celsius

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

Metric to English

Mass

1 g = 0.0353 oz

1 kg = 2.202 lbs

Distance

1 cm = 0.3937 in

1 m = 3.28 ft

1 m = 1.0935 yd

1 km = 0.621 miles

Volume

1 ml = 0.0338 fl oz

1 L = 0.2642 gal

Temperature

Celsius to Fahrenheit

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

Metric to Metric Equivalents

1 dekameters (dam) = 10 meters (m)	0.1 dam = 1 m
1 hectameters (hm) = 100 m	0.01 hm = 1 m
1 kilometer (km) = 1,000 m	0.001 km = 1 m
1 Megameter (Mm) = 1,000,000 m	0.000001 Mm = 1 m
1 meter (m) = 10 decimeters (dm)	0.1 m = 1 dm
1 m = 100 centimeters (cm)	0.01 m = 1 cm
1 m = 1,000 millimeters (mm)	0.001 m = 1 mm
1 m = 1,000,000 micrometers (**µ**m)	0.000001 m = 1 **µ**m
1 m = 1,000,000,000 = nanometers (nm)	0.000000001 m = 1 nm

Some SI Prefixes

Factor	Prefix	Abbreviation
10^{6}	Mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10^{1}	deka	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	**µ**
10^{-9}	nano	n
10^{-12}	pico	p

International Units System (SI)

Quantity	Name	SI Unit Abbrev.
Length	meter	m
Mass	kilogram	kg
Time	second	s
Temperature	Kelvin	K
Amount of Substance	mole	mol
Electric Current	ampere	A
Luminous Intensity	candela	cd

Conversion Problems Worksheet

Name: _____ **Date:** _____ **Grade:** _____

One Step Conversion Problems ~ English ↔ Metric

A. Convert the units on the left to the units on the right.

Given		Looking For	
1.	78 feet	1. _____	meters
2.	15 kilometers	2. _____	miles
3.	6 inches	3. _____	centimeters
4.	8 fluid ounces	4. _____	milliliters
5.	5 liters	5. _____	gallons
6.	8.5 pounds	6. _____	kilograms
7.	200 grams	7. _____	ounces
8.	25 milliliters	8. _____	fluid ounces
9.	75 centimeters	9. _____	inches
10.	9.0 kilograms	10. _____	pounds

Two Step Conversion Problems ~ Type 1

B. Convert the units on the left to the units on the right.

Given		Looking For	
1.	18.4 fluid ounces	1. _____	liters
2.	2 days	2. _____	minutes
3.	1,250 grams	3. _____	pounds
4.	3,195 yards	4. _____	kilometers
5.	5.4 liters	5. _____	fluid ounces
6.	4,196 grams	6. _____	pounds
7.	2.5 gallons	7. _____	milliliters
8.	1.8 meters	8. _____	inches
9.	425 ounces	9. _____	kilograms
10.	20 inches	10. _____	meters

Two Step Conversion Problems ~ Type 2

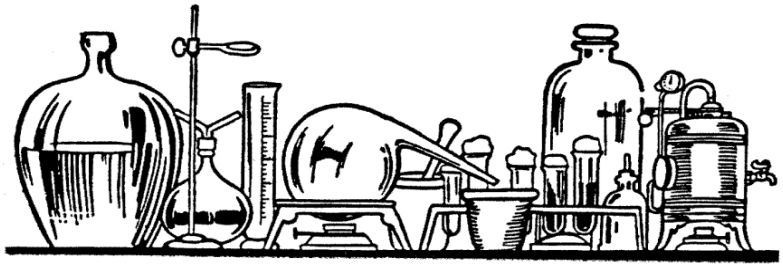
C. Convert the units on the left to the units on the right.

Given		Looking For	
1.	340 miles/hour	1. _____	km/minute
2.	6.5 ounces/in	2. _____	ml/cm
3.	576 milliliters/minute	3. _____	fluid oz/hour
4.	18.5 gallons/day	4. _____	liters/hour
5.	238 pounds/gallon	5. _____	kg/liter
6.	37.4 ounces/inch	6. _____	grams/cm
7.	1,250 milliliters/kilogram	7. _____	fluid oz/pound
8.	72 kilograms/meter	8. _____	pounds/feet
9.	446 grams/liter	9. _____	ounces/gallon
10.	98 inches/second	10. _____	cm/minute

Three Step Conversion Problems

D. Convert the units on the left to the units on the right.

Given		Looking For	
1.	690 inches/minute	1. _____	meters/hour
2.	812 ounces/gallon	2. _____	kg/liter
3.	5,416 fluid ounces/day	3. _____	liters/hour
4.	24 pounds/day	4. _____	kg/minute
5.	37.5 gallons/yard	5. _____	ml/meter
6.	1,892 milliliters/second	6. _____	liters/hour
7.	9.6 liters/hour	7. _____	ml/second
8.	13.2 kilometers/day	8. _____	meters/min
9.	427 ounces/gallon	9. _____	kg/liter
10.	7,621 grams/centimeter	10. _____	pounds/inch



Conversion Problems Worksheet
Answer Key

Name: _____ **Date:** _____ **Grade:** _____

One Step Conversion Problems ~ English ↔ Metric

A. Convert the units on the left to the units on the right.

Given		Looking For	
1.	78 feet	1. 23.8	meters
2.	15 kilometers	2. 9.32	miles
3.	6 inches	3. 15.24	centimeters
4.	8 fluid ounces	4. 236.68	milliliters
5.	5 liters	5. 1.32	gallons
6.	8.5 pounds	6. 3.86	kilograms
7.	200 grams	7. 7.06	ounces
8.	25 milliliters	8. 0.85	fluid ounces
9.	75 centimeters	9. 29.53	inches
10.	9.0 kilograms	10. 19.82	pounds

Two Step Conversion Problems ~ Type 1

B. Convert the units on the left to the units on the right.

Given		Looking For	
1.	18.4 fluid ounces	1. 0.544	liters
2.	2 days	2. 2,880	minutes
3.	1,250 grams	3. 2.758	pounds
4.	3,195 yards	4. 2.92	kilometers
5.	5.4 liters	5. 182.52	fluid ounces
6.	4,196 grams	6. 9.26	pounds
7.	2.5 gallons	7. 9,462.5	milliliters
8.	1.8 meters	8. 71	inches
9.	425 ounces	9. 12.0	kilograms
10.	20 inches	10. 0.508	meters

Two Step Conversion Problems ~ Type 2

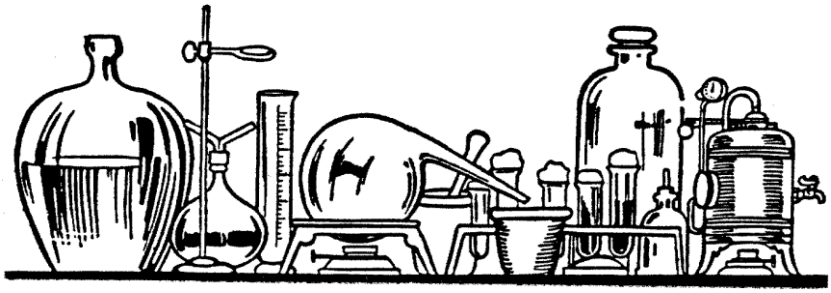
C. Convert the units on the left to the units on the right.

Given		Looking For	
1.	340 miles/hour	1. 9.123	km/minute
2.	6.5 ounces/in	2. 75.71	ml/cm
3.	576 milliliters/minute	3. 1,168.1	fluid oz/hour
4.	18.5 gallons/day	4. 2.918	liters/hour
5.	238 pounds/gallon	5. 28.6	kg/liter
6.	37.4 ounces/inch	6. 417.1	grams/cm
7.	1,250 milliliters/kilogram	7. 19.2	fluid oz/pound
8.	72 kilograms/meter	8. 48.34	pounds/feet
9.	446 grams/liter	9. 59.59	ounces/gallon
10.	98 inches/second	10. 14,935.2	cm/minute

Three Step Conversion Problems

D. Convert the units on the left to the units on the right.

Given		Looking For	
1.	690 inches/minute	1. 1051.56	meters/hour
2.	812 ounces/gallon	2. 6.08	kg/liter
3.	5,416 fluid ounces/day	3. 6.68	liters/hour
4.	24 pounds/day	4. 0.0076	kg/minute
5.	37.5 gallons/yard	5. 155,210	ml/meter
6.	1,892 milliliters/second	6. 6.81	liters/hour
7.	9.6 liters/hour	7. 2.67	ml/second
8.	13.2 kilometers/day	8. 9.167	meters/min
9.	427 ounces/gallon	9. 3.196	kg/liter
10.	7,621 grams/centimeter	10. 42.71	pounds/inch



A. One Step Conversion Problems

1. 78 ft x $\frac{0.305\ m}{1\ ft}$ = 23.79 m 78 ft x $\frac{1\ meter}{3.28\ ft}$ = 23.78 m

2. 15 km x $\frac{0.621\ miles}{1\ km}$ = 9.315 miles 15 km x $\frac{1\ mile}{1.61\ km}$ = 9.317 miles

3. 6 in x $\frac{2.54\ cm}{1\ in}$ = 15.24 cm 6 in x $\frac{1\ cm}{0.3937\ in}$ = 15.24 cm

4. 8 fl oz x $\frac{29.585\ ml}{1\ fl\ oz}$ = 236.68 ml 8 fl oz x $\frac{1\ ml}{0.0338\ fl\ oz}$ = 236.68 ml

5. 5 L x $\frac{0.2642\ gal}{1\ L}$ = 1.32 gal 5 L x $\frac{1\ gal}{3.785\ L}$ = 1.32 gal

6. 8.5 lb x $\frac{0.454\ kg}{1\ lb}$ = 3.86 kg 8.5 lb x $\frac{1\ kg}{2.202\ lb}$ = 3.86 kg

7. 200 g x $\frac{0.0353\ oz}{1\ g}$ = 7.06 oz 200 g x $\frac{1\ oz}{28.33\ g}$ = 7.06 oz

8. 25 ml x $\frac{0.0338\ fl\ oz}{1\ ml}$ = 0.85 fl oz 25 ml x $\frac{1\ fl\ oz}{29.585\ ml}$ = 0.85 fl oz

9. 75 cm x $\frac{0.3937\ in}{1\ cm}$ = 29.53 in 75 cm x $\frac{1\ in}{2.54\ cm}$ = 29.53 in

10. 9.0 kg x $\frac{2.202\ lb}{1\ kg}$ = 19.82 lb 9.0 kg x $\frac{1\ lb}{0.454\ kg}$ = 19.82 lb

B. Two Step Conversion Problems ~ Type 1

1. 18.4 fl oz x $\frac{29.585\ ml}{1\ fl\ oz}$ x $\frac{1\ L}{1{,}000\ ml}$ = 0.544 L 18.4 fl oz x $\frac{1\ ml}{0.0338\ fl\ oz}$ x $\frac{0.001\ L}{1\ ml}$ = 0.544 L

2. 2 days x $\frac{24\ hrs}{1\ day}$ x $\frac{60\ min}{1\ hr}$ = 2,880 min

3. 1,250 g x $\frac{0.0353\ oz}{1\ g}$ x $\frac{1\ lb}{16\ oz}$ = 2.758 lb 1,250 g x $\frac{1\ oz}{28.33\ g}$ x $\frac{1\ lb}{16.oz}$ = 2.758 lb

4. 3,195 yd x $\frac{0.9145\ m}{1\ yd}$ x $\frac{1\ km}{1{,}000\ m}$ = 2.92 km 3,195 yd x $\frac{1\ m}{1.0935\ yd}$ x $\frac{0.001\ km}{1\ m}$ = 2.92 km

5. 5.4 L x $\frac{1{,}000\ ml}{1\ L}$ x $\frac{0.0338\ fl\ oz}{1\ ml}$ = 182.52 fl oz 54.L x $\frac{1\ ml}{0.001\ L}$ x $\frac{1\ fl\ oz}{29.585\ ml}$ = 182.52 fl oz

6. 4,196 g x $\frac{0.0353\ oz}{1\ g}$ x $\frac{1\ lb}{16\ oz}$ = 9.26 lbs 4,196 g x $\frac{1\ oz}{28.33\ g}$ x $\frac{1\ lb}{16\ oz}$ = 9.26 lbs

7. 2.5 gal x 3.785 L / 1 gal x 1,000 ml / 1 L = 9,462.5 ml 2.5 gal x 1 L / 0.2642 gal x 1 ml / 0.001 L = 9,462.5 ml

8. 1.8 m x 3.28 ft / 1 m x 12 in / 1 ft = 70.85 in 1.8 m x 1 ft / 0.305 m x 12 in / 1 ft = 70.85 in

   1.8 m x 1.0935 yd / 1 m x 36 in / 1 yd = 70.86 in 1.8 m x 1 yd / 0.9145 m x 36 in / 1 yd = 70.86 in

9. 425 oz x 28.33 g / 1 oz x 0.001 kg / 1 g = 12.0 kg 425 oz x 1 g / 0.0353 oz x 1 kg / 1,000 g = 12.0 kg

   425oz x 1 lb / 16 oz x 0.454 kg / 1 lb = 12.06 kg 425 oz x 1 lb / 16 oz x 1 kg / 2.202 lb = 12.06 kg

10. 20 in x 2.54 cm / 1 in x 0.001 m / 1 cm = 0.508 m 20 in x 1 cm / 0.3937 in x 1 m / 100 cm = 0.508 m

    20 in x 1 ft / 12 in x 0.305 m / 1 ft = 0.508 m 20 in x 1 ft / 12 in x 1 m / 3.28 ft = 0.508 m

C. Two Step Conversion Problems ~ Type 2

1. 340 miles / 1 hr x 1.61 km / 1 mile x 1 hr / 60 min = 9.123 km / 1 min 340 miles / 1 hr x 1 km / 0.621 mi x 1 hr / 60 min = 9.125 km / 1 min

2. 6.5 fl oz / 1 in x 29.583 ml / 1 fl oz x 1 in / 2.54 cm = 75.71 ml / 1 cm 6.5 fl oz / 1 in x 1 ml / 0.0338 fl oz x 0.3937 in / 1 cm = 75.71 ml / 1 cm

3. 576 ml / 1 min x 0.0338 fl oz / 1 ml x 60 min / 1 hr = 1,168 fl oz / 1 hr 576 ml / 1 min x 1 fl oz / 29.585 ml x 60 min / 1 hr = 1,168 fl oz / 1 hr

4. 18.5 gal / 1 day x 3.785 L / 1 gal x 1 day / 24 hr = 2.918 L / 1 hr 18.5 gal / 1 day x 1 L / 0.2642 gal x 1 day / 24 hr = 2.918 L / 1 h r

5. 238 lb / 1 gal x 0.454 kg / 1 lb x 1 gal / 3.785 L = 28.55 kg / 1 L 238 lb / 1 gal x 1 kg / 2.202 lb x 0.2642 gal / 1 L = 28.56 kg / 1 L

6. 37.4 oz / 1 in x 28.33 g / 1 oz x 1 in / 2.54 cm = 417.1 g / 1 cm 37.4 oz / 1 in x 1 g / 0.0353 oz x 0.3937 in / 1 cm = 417.1 g / 1 cm

7. 1,250 ml / 1 kg x 0.0338 fl oz / 1 ml x 1 kg / 2.202 lb = 19.19 fl oz / 1 lb 1,250 ml / 1 kg x 1 fl oz / 28.585 ml x 0.454 kg / 1 lb = 19.18 fl oz / 1 lb

8. 72 kg / 1 m x 2.202 lb / 1 kg x 1 m / 3.28 ft = 48.34 lb / 1 ft 72 kg / 1 m x 1 lb / 0.454 kg x 0.305 m / 1 ft = 48.37 lb / 1 ft

9. 446 g / 1 L x 0.0353 oz / 1 g x 1 L / 0.2642 gal = 59.59 oz / 1 gal 446 g / 1 L x 1 oz / 28.33 g x 3.785 L / 1 gal = 59.59 lb / 1 gal

10. $\frac{98\text{ in}}{1\text{ sec}} \times \frac{2.54\text{ cm}}{1\text{ in}} \times \frac{60\text{ sec}}{1\text{ min}} = \frac{14{,}935.2\text{ cm}}{1\text{ min}}$ $\frac{98\text{ in}}{1\text{ sec}} \times \frac{1\text{ cm}}{0.3937\text{ in}} \times \frac{60\text{ sec}}{1\text{ min}} = \frac{14{,}935.2\text{ cm}}{1\text{ min}}$

D. Three Step Conversion Problems

1. $\frac{690\text{ in}}{1\text{ min}} \times \frac{2.54\text{ cm}}{1\text{ in}} \times \frac{0.01\text{ m}}{1\text{ cm}} \times \frac{60\text{ min}}{1\text{ hr}} = \frac{1{,}051.56\text{ m}}{1\text{ hr}}$ $\frac{690\text{ in}}{1\text{ min}} \times \frac{1\text{ cm}}{0.3937\text{ in}} \times \frac{1\text{ m}}{100\text{ cm}} \times \frac{60\text{ min}}{1\text{ hr}} = \frac{1{,}051.56\text{ m}}{1\text{ hr}}$

2. $\frac{812\text{ oz}}{1\text{ gal}} \times \frac{28.33\text{ g}}{1\text{ oz}} \times \frac{0.001\text{ kg}}{1\text{ g}} \times \frac{1\text{ gal}}{3.785\text{ L}} = \frac{6.08\text{ kg}}{1\text{ L}}$ $\frac{812\text{ oz}}{1\text{ gal}} \times \frac{1\text{ g}}{0.0353\text{ oz}} \times \frac{1\text{ kg}}{1{,}000\text{ g}} \times \frac{0.2642\text{ gal}}{1\text{ L}} = \frac{6.08\text{ kg}}{1\text{ L}}$

3. $\frac{5416\text{ fl oz}}{1\text{ day}} \times \frac{29.585\text{ ml}}{1\text{ fl oz}} \times \frac{0.001\text{ L}}{1\text{ ml}} \times \frac{1\text{ day}}{24\text{ hr}} = \frac{6.68\text{ L}}{1\text{ hr}}$ $\frac{5416\text{ fl oz}}{1\text{ day}} \times \frac{1\text{ ml}}{0.0338\text{ fl oz}} \times \frac{1\text{ L}}{1{,}000\text{ ml}} \times \frac{1\text{ day}}{24\text{ hr}} = \frac{6.68\text{ L}}{1\text{ hr}}$

4. $\frac{24\text{ lb}}{1\text{ day}} \times \frac{0.454\text{ kg}}{1\text{ lb}} \times \frac{1\text{ day}}{24\text{ hr}} \times \frac{1\text{ hr}}{60\text{ min}} = \frac{0.0076\text{ kg}}{1\text{ min}}$ $\frac{24\text{ lb}}{1\text{ day}} \times \frac{1\text{ kg}}{2.202\text{ lb}} \times \frac{1\text{ day}}{24\text{ hr}} \times \frac{1\text{ hr}}{60\text{ min}} = \frac{0.0076\text{ kg}}{1\text{ min}}$

5. $\frac{37.5\text{ gal}}{1\text{ yd}} \times \frac{3.785\text{ L}}{1\text{ gal}} \times \frac{1{,}000\text{ ml}}{1\text{ L}} \times \frac{1\text{ yd}}{0.9145\text{ m}} = \frac{155{,}210\text{ ml}}{1\text{ m}}$ $\frac{37.5\text{ gal}}{1\text{ yd}} \times \frac{1\text{ L}}{0.2642\text{gal}} \times \frac{1\text{ ml}}{0.001\text{L}} \times \frac{1.0935\text{ yd}}{1\text{ m}} = \frac{155{,}210\text{ ml}}{1\text{ m}}$

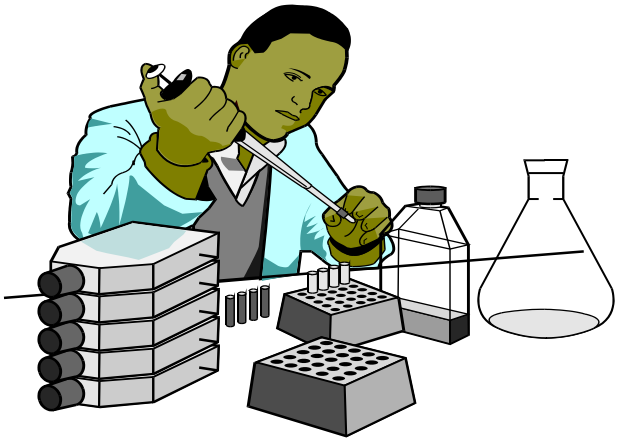
6. $\frac{1.892\text{ ml}}{1\text{ sec}} \times \frac{0.001\text{ L}}{1\text{ ml}} \times \frac{60\text{ sec}}{1\text{ min}} \times \frac{60\text{ min}}{1\text{ hr}} = \frac{6.81\text{ L}}{1\text{ hr}}$ $\frac{1.892\text{ ml}}{1\text{ sec}} \times \frac{1\text{ L}}{1{,}000\text{ ml}} \times \frac{60\text{ sec}}{1\text{ min}} \times \frac{60\text{ min}}{1\text{ hr}} = \frac{6.81\text{ L}}{1\text{ hr}}$

7. $\frac{9.6\text{ L}}{1\text{ hr}} \times \frac{1{,}000\text{ ml}}{1\text{ L}} \times \frac{1\text{ hr}}{60\text{ min}} \times \frac{1\text{ min}}{60\text{ sec}} = \frac{2.67\text{ ml}}{1\text{ sec}}$ $\frac{9.6\text{ L}}{1\text{ hr}} \times \frac{1\text{ml}}{0.001\text{ L}} \times \frac{1\text{ hr}}{60\text{ min}} \times \frac{1\text{ min}}{60\text{ sec}} = \frac{2.67\text{ ml}}{1\text{ sec}}$

8. $\frac{13.2\text{ km}}{1\text{ day}} \times \frac{1{,}000\text{ m}}{1\text{ km}} \times \frac{1\text{ day}}{24\text{ hrs}} \times \frac{1\text{ hr}}{60\text{ min}} = \frac{9.167\text{ m}}{1\text{ min}}$ $\frac{13.2\text{ km}}{1\text{ day}} \times \frac{1\text{ m}}{0.001\text{ km}} \times \frac{1\text{ day}}{24\text{ hrs}} \times \frac{1\text{ hr}}{60\text{ min}} = \frac{9.167\text{ m}}{1\text{ min}}$

9. $\frac{427\text{ oz}}{1\text{ gal}} \times \frac{28.33\text{ g}}{1\text{ oz}} \times \frac{0.001\text{ kg}}{1\text{ g}} \times \frac{1\text{ gal}}{3.785\text{ L}} = \frac{3.196\text{ kg}}{1\text{ L}}$ $\frac{427\text{ oz}}{1\text{ gal}} \times \frac{1\text{ g}}{0.0353\text{ oz}} \times \frac{1\text{ kg}}{1{,}000\text{ g}} \times \frac{0.2642\text{ gal}}{1\text{ L}} = \frac{3.196\text{ kg}}{1\text{ L}}$

10. $\frac{7{,}621\text{ g}}{1\text{ cm}} \times \frac{0.0353\text{ oz}}{1\text{ g}} \times \frac{1\text{ lb}}{16\text{ oz}} \times \frac{1\text{ cm}}{0.03937\text{ in}} = \frac{42.72\text{ lb}}{1\text{ in}}$ $\frac{7{,}621\text{ g}}{1\text{ cm}} \times \frac{1\text{ oz}}{28.33\text{ g}} \times \frac{1\text{ lb}}{16\text{ oz}} \times \frac{2.54\text{ cm}}{1\text{ in}} = \frac{42.71\text{ lb}}{1\text{ in}}$



Worksheet Grading Rubric: 135/135 Points

Problems	Correct Set-up	All Labels	Correct Answer	Total Points
A. 1 – 10	1 pt each	0.5 pts each	1 pt each	Total 2.5 pts each
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
B. 1 - 10	1.5 pts each	0.5 pts each	1 pt each	Total 3 pts each
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
C. 1 - 10	1.5 pts each	1 pt each	1 pt each	Total 3.5 pts each
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
D. 1 - 10	2 pts each	1.5 pts each	1 pt each	Total 4.5 pts each
1				
.2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Conversion Problems Quiz

Name: _____ Date: _____ Grade: _____

1. _____ Another name for Dimensional Analysis is _____.
   A. Proportions
   B. Label Method
   C. Fraction Method
   D. Factor – Label Method

2. _____ All standard or situational equivalents can be represented by ____ fractions.
   A. 1 B. 2 C. 3 D. 4

3. _____ The Dimensional Analysis problem solving scheme is _____.
   A. given data x what you're looking for = specific fractional equivalent
   B. what you're looking for x specific fractional equivalent = given data
   C. given data x specific fractional equivalent = what you're looking for
   D. none of the above

4. _____ Convert 1,440 seconds to hours.
   A. 51,840,000 hours C. 864,000 hours
   B. 240 hours D. 4 hours

5. _____ Convert 500 grams to pounds.
   A. 1.1 pounds C. 226,628.9 pounds
   B. 282.4 pounds D. 0.001 pounds

6. _____ Convert 20 ounces/gallon to grams/liter.
   A. 2.7 grams/liter C. 0.19 grams/liter
   B. 149.7 grams/liter D. 2,144.6 grams/liter

7. _____ Convert 50 pounds/day to kilograms/hour.
   A. 544.8 kg/hr C. 2,643.2 kg/hr
   B. 4.59 kg/hr D. 0.9 kg/hr

8. _____ Convert 15 mile/hour to kilometers/hour.
   A. 0.40 km/hr C. 9.32 km/hr
   B. 24.15 km/hr D. 2.42 km/hr

9. _____ Convert 25 kilometers/day to meters/minute.
   A. 17.36 m/min C. 1,000 m/min
   B. 0.001736 m/min D. 36 m/min

10. _____ Convert 50 gallon/yard to milliliters/millimeter.
    A. 14.4 ml/mm C. 207 ml/mm
    B. 12.1 ml/mm D. 0.207 ml/mm

Conversion Problems Quiz
Answer Key

1. __D__ Another name for Dimensional Analysis is _____.
   - A. Proportions
   - B. Label Method
   - C. Fraction Method
   - D. Factor – Label Method

2. __B__ All standard or situational equivalents can be represented by ____ fractions.
   A. 1 B. 2 C. 3 D. 4

3. __C__ The Dimensional Analysis problem solving scheme is _____.
   - A. given data x what you're looking for = specific fractional equivalent
   - B. what you're looking for x specific fractional equivalent = given data
   - C. given data x specific fractional equivalent = what you're looking for
   - D. none of the above

4. __D__ Convert 1,440 seconds to hours.
   - A. 51,840,000 hours
   - B. 240 hours
   - C. 864,000 hours
   - D. 4 hours

   $$14{,}400 \text{ sec} \times \frac{1 \text{ min}}{60 \text{ sec}} \times \frac{1 \text{hr}}{60 \text{ min}} = 4 \text{ hrs}$$

5. __A__ Convert 500 grams to pounds.
   - A. 1.1 pounds
   - B. 282.4 pounds
   - C. 226,628.9 pounds
   - D. 0.001 pounds

   $$500 \text{ g} \times \frac{0.0353 \text{ oz}}{1 \text{ g}} \times \frac{1 \text{ lb}}{16 \text{ oz}} = 1.1 \text{ lb}$$

   $$500 \text{ g} \times \frac{1 \text{ oz}}{28.33 \text{ g}} \times \frac{1 \text{ lb}}{16 \text{ oz}} = 1.1 \text{ lb}$$

6. __B__ Convert 20 ounces/gallon to grams/liter.
   - A. 2.7 grams/liter
   - B. 149.7 grams/liter
   - C. 0.19 grams/liter
   - D. 2,144.6 grams/liter

   $$\frac{20 \text{ oz}}{1 \text{ gal}} \times \frac{1 \text{ g}}{0.0353 \text{ oz}} \times \frac{0.2642 \text{ gal}}{1 \text{ L}} = \frac{149.7 \text{ g}}{1 \text{ L}}$$

   $$\frac{20 \text{ oz}}{1 \text{ gal}} \times \frac{28.33 \text{ g}}{1 \text{ oz}} \times \frac{1 \text{ gal}}{3.785 \text{ L}} = \frac{149.7 \text{ g}}{1 \text{ L}}$$

   $$\frac{20 \text{ oz}}{1 \text{ gal}} \times \frac{1 \text{ g}}{0.0353 \text{ oz}} \times \frac{1 \text{ gal}}{3.785 \text{ L}} = \frac{149.7 \text{ g}}{1 \text{ L}}$$

   $$\frac{20 \text{ oz}}{1 \text{ gal}} \times \frac{28.33 \text{ g}}{1 \text{ oz}} \times \frac{0.2642 \text{ gal}}{1 \text{ L}} = \frac{149.7 \text{ g}}{1 \text{ L}}$$

7. __D__ Convert 50 pounds/day to kilograms/hour.
   - A. 544.8 kg/hr
   - B. 4.59 kg/hr
   - C. 2,643.2 kg/hr
   - D. 0.9 kg/hr

   $$\frac{50 \text{ lb}}{1 \text{ day}} \times \frac{1 \text{ kg}}{2.202 \text{ lb}} \times \frac{1 \text{ day}}{24 \text{ hrs}} = \frac{0.9 \text{ kg}}{1 \text{ hr}}$$

   $$\frac{50 \text{ lb}}{1 \text{ day}} \times \frac{0.454 \text{ kg}}{1 \text{ lb}} \times \frac{1 \text{ day}}{24 \text{ hrs}} = \frac{0.9 \text{ kg}}{1 \text{ hr}}$$

8. __B__ Convert 15 mile/hour to kilometers/hour.

A. 0.40 km/hr C. 9.32 km/hr
B. 24.15 km/hr D. 2.42 km/hr

$$\frac{15 \text{ miles}}{1 \text{ hr}} \times \frac{1.61 \text{ km}}{1 \text{ mile}} = \frac{24.15 \text{ km}}{1 \text{ hr}} \qquad \frac{15 \text{ miles}}{1 \text{ hr}} \times \frac{1 \text{ km}}{0.621 \text{ miles}} = \frac{24.15 \text{ km}}{1 \text{ hr}}$$

9. __A__ Convert 25 kilometers/day to meters/minute.

A. 17.36 m/min C. 1,000 m/min
B. 0.001736 m/min D. 36 m/min

$$\frac{25 \text{ km}}{1 \text{ day}} \times \frac{1{,}000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ day}}{24 \text{ hrs}} \times \frac{1 \text{ hr}}{60 \text{ min}} = \frac{17.36 \text{ m}}{1 \text{ min}} \qquad \frac{25 \text{ km}}{1 \text{ day}} \times \frac{1 \text{ m}}{0.001 \text{ km}} \times \frac{1 \text{ day}}{24 \text{ hrs}} \times \frac{1 \text{ hr}}{60 \text{ min}} = \frac{17.36 \text{ m}}{1 \text{ min}}$$

10. __C__ Convert 50 gallon/yard to milliliters/millimeter.

A. 14.4 ml/mm C. 207 ml/mm
B. 12.1 ml/mm D. 0.207 ml/mm

$$\frac{50 \text{ gal}}{1 \text{ yd}} \times \frac{3.785 \text{ L}}{1 \text{ gal}} \times \frac{1{,}000 \text{ ml}}{1 \text{ L}} \times \frac{1 \text{ yd}}{0.9145 \text{ m}} \times \frac{1 \text{ m}}{1{,}000 \text{ mm}} = \frac{207 \text{ ml}}{1 \text{ mm}}$$

$$\frac{50 \text{ gal}}{1 \text{ yd}} \times \frac{3.785 \text{ L}}{1 \text{ gal}} \times \frac{1{,}000 \text{ ml}}{1 \text{ L}} \times \frac{1.0935 \text{ yd}}{1 \text{ m}} \times \frac{0.001 \text{ m}}{1 \text{ mm}} = \frac{207 \text{ ml}}{1 \text{ mm}}$$

$$\frac{50 \text{ gal}}{1 \text{ yd}} \times \frac{1 \text{ L}}{0.2642 \text{ gal}} \times \frac{1 \text{ ml}}{0.001 \text{ L}} \times \frac{1 \text{ yd}}{0.9145 \text{ m}} \times \frac{1 \text{ m}}{1{,}000 \text{ mm}} = \frac{207 \text{ ml}}{1 \text{ mm}}$$

$$\frac{50 \text{ gal}}{1 \text{ yd}} \times \frac{1 \text{ L}}{0.2642 \text{ gal}} \times \frac{1 \text{ ml}}{0.001 \text{ L}} \times \frac{1.0935 \text{ yd}}{1 \text{ m}} \times \frac{0.001 \text{ m}}{1 \text{ mm}} = \frac{207 \text{ ml}}{1 \text{ mm}}$$

Quiz Grading Rubric: 30/30 Points

Problems	1 pt each		Problems	1.5 pts each
1.			3.	
2.			8.	

Problems	Correct Set-up	Correct Labels	Correct Answer	Total Points
	1 pt each	1 pt each	1 pt each	Total 3 pts
4.				
5.				
	2 pts each	1 pt each	1 pt each	Total 4 pts
6.				
7.				
	2 pts each	1 pt each	2 pts each	Total 5 pts
9.				
	2 pts each	2 pts each	2 pts each	Total 6 pts
10.				