MEASUREMENTS AND CONVERSIONS

NAME _____ SCHOOL _____

DATE STARTED_____ DATE COMPLETED_____

PREREQUISITE: Arithmetic through fractions and decimals.

HOW TO DO THIS COURSE: Do the steps one at a time, in order. When you finish a step, put your initials and the date on the sign-off line on the right. A split line means get a pass (and an initial) from another student (or your supervisor if it says that). The Define statement means to refer to the "Glossary" section of DS #4934 Measurements and Conversions—Glossary and Tables.

PURPOSE: To gain the ability to use the customary and metric systems of measurement, and convert measurements from the units of one system to the units of the other.

ESTIMATED TIME: 5–7 hours

MATERIALS NEEDED FOR THIS COURSE

yardstick, ounce measure, cup measure, pint measure, quart measure, gallon measure, ounce scale, pound scale, meter stick, milliliter measure, liter measure, gram scale, kilogram scale, containers of unknown capacity and varying size.

Heron study booklet with these Data Sheets: 4933 4934
Exam: 4935

NOTE TO THE STUDENT

Write down all the measurements you make in the practical applications, and save them. You will need them again later in the course.

A. LENGTH

A1. Customary Units

1. DEFINE: Use DS #4934 Measurements and Conversions—Glossary and Tables, section "Glossary."

   measure ___ width ___ accuracy ___
   length ___ height ___ _____

2. DEMONSTRATE: Get a yardstick.

   a) There are 36 inches in a yard. Find the inch marks on the yardstick. ___

   b) Inches are broken up into parts of inches. Find the marks for 1/2 inch. Find the marks for 1/4 inch. Find the marks for 1/8 inch. Find the marks for 1/16 inch. ___

   c) There are 12 inches in one foot. Find one foot on the yardstick. ___

   d) There are 3 feet in one yard. Find three feet on the yardstick. ___ _____

3. DRILL: Measure things around you in yards, feet, inches, and parts of inches until you can do so easily and accurately. _____

4. PRACTICAL APPLICATION: Use a yardstick or tape measure to measure in feet and inches:

   a) The height of a table. ___

   b) The height of another student. ___

   c) The size of this paper. ___

   d) The size of one floor tile. ___

   e) The width of the floor. ___

   Record your measurements. ____ ____

A2. Metric Units

1. DEFINE: metric. (You will find out what a meter is on the next step.) _____

2. DEMONSTRATE: Get a meter stick.

   a) There are 10 decimeters in a meter. Find the decimeter marks on the meter stick. ___

   b) There are 100 centimeters in a meter. Find the centimeter marks on the meter stick. ___

   c) There are 1000 millimeters in a meter. Find the millimeter marks on the meter stick. ___ _____

3. DRILL: Measure things around you in meters, decimeters, centimeters and millimeters until you can do so easily and accurately. _____

4. PRACTICAL APPLICATION: Use a meter stick or tape measure to measure in metric units (meters and parts of meters) the same things you measured in A1 step 4 above:

   a) the height of a table. ___

   b) the height of another student. ___

   c) the size of this paper. ___

   d) the size of one floor tile. ___

   e) the width of the floor. ___

   Record your measurements. ____ ____

B. CAPACITY

B1. Customary Units

1. DEFINE: volume ___ capacity ___ _____

2. DEMONSTRATE: Get a container or containers marked in ounces, cups, pints, quarts and gallons. Find the ounce marks on a container marked in ounces (abbreviated "oz.").

   a) There are 8 ounces in a cup. Find the mark for 1 cup on a container. ___

   b) There are 2 cups in a pint. Find the mark for 1 pint on a container. ___

   c) There are 2 pints in a quart. Find the mark for 1 quart on a container. ___

   d) There are 4 quarts in a gallon. Find the mark for 1 gallon on a container. ___ _____

3. DRILL: Using the containers you have, measure different volumes of water in ounces, cups, pints, quarts and gallons until you can do so easily and accurately. _____

4. PRACTICAL APPLICATION: Get 3 containers of unknown capacity: one large, one medium sized, one small. Find out how much water each one will hold. Record your answers in customary units (gallons, quarts, pints, cups, ounces).

   a) small ___ b) medium ___ c) large ___ _____

B2. Metric Units

1. DEMONSTRATE: Get a container or containers marked in metric units (liters and mililiters).

   a) Find the marks for milliliters. ___

   b) There are 1000 milliliters in a liter. Find the mark for 1 liter on a container. _____

2. DRILL: Using the containers you have, measure different volumes of water in milliliters and liters until you can do so easily and accurately. _____

3. PRACTICAL APPLICATION: Using the same 3 containers from section B1 step 4 above, find out how much each one will hold in metric units (liters and milliliters). Record your measurements.

   a) small ___ b) medium ___ c) large ___ ____ ____

C. WEIGHT AND MASS

C1. Customary Units

1. DEFINE: weight ___ mass ____ _____
2. DEMONSTRATE: Get a scale marked in customary units.
   a) Find the pound marks (pound is abbreviated "lb."). ___
   b) There are 16 ounces in a pound. Find the ounce marks on the scale. _____
3. DRILL: Weigh things around you in pounds and ounces until you can do so easily and accurately. _____
4. PRACTICAL APPLICATION: Weigh the following items (in pounds and ounces), and record their weights:
   a) your body. ___
   b) a big book. ___
   c) a pencil or pen. ___
   d) a clay model of the pencil or pen, as close to the size of the real one as you can make it. ___ ____ ____

C2. Metric Units

1. DEMONSTRATE: Get a scale marked in metric units (kilograms and grams).
   a) Find the kilogram marks. ___
   b) There are 1000 grams in a kilogram. Find the gram marks on the scale. ___ _____
2. DRILL: Find the mass of things around you in kilograms and grams until you can do so easily and accurately. _____
3. PRACTICAL APPLICATION: Find the masses of the same items you used in C1 step 4 above in kilograms and grams. Record your results:
   a) your body. ___
   b) a big book. ___
   c) a pencil or pen. ___
   d) a clay model of the pencil or pen. ___ ____ ____

D. CONVERTING MEASUREMENTS

D1. Conversions

1. DEFINE: conversion. _____

2. READ: DS #4933 Measurements and Conversions. _____

3. DEMONSTRATE (with whatever objects you wish to use): From the definitions given in the data sheet, demonstrate each of the following conversions:

   a) millimeters to meters. ___

   b) centimeters to meters. ___

   c) decimeters to meters. ___

   d) grams to kilograms. ___ ____ ____

4. DRILL: Measure the length of something in metric units. Express its length in terms of meters, then in terms of decimeters, then centimeters, then millimeters. Repeat this for different things until you can express the same length in various metric units easily and quickly. ____ ____

5. DRILL: Measure the mass of something in kilograms. Express its mass in terms of grams, then in terms of milligrams. Repeat this for different things until you can express the same mass in various metric units easily and quickly. ____ ____

D2. Converting Customary Measurements to Metric

1. DEMONSTRATE (with objects): Refer to DS #4934 Measurements and Conversions—Glossary and Tables, section "Tables." Demonstrate each of the following conversions:

   a) inches to centimeters. ___

   b) feet to meters. ___

   c) yards to meters. ___

   d) miles to kilometers. ___ ____ ____

2. PRACTICAL APPLICATION: Convert the lengths you recorded in customary units in section A1, step 4 to metric lengths. Compare your results to the metric lengths you recorded in A2 step 4. ____ ____

3. DEMONSTRATE (with objects): Refer to DS #4934, section "Tables." Demonstrate each of the following conversions:

   a) ounces to milliliters. ___

   b) pints to liters. ___

   c) quarts to liters. ___

   d) gallons to liters. ___ ____ ____

4. PRACTICAL APPLICATION: Convert the volumes you recorded in customary units in section B1, step 4 to metric volumes. Compare your results to the metric volumes you recorded in B2 step 3. ____ ____

5. DEMONSTRATE (with objects): Refer to DS #4934, section "Tables." Demonstrate each of the following conversions:

   a) ounces to grams. ___

   b) pounds to kilograms. ___ ____ ____

6. PRACTICAL APPLICATION: Convert the weights you recorded in customary units in section C1, step 4 to their equivalent metric masses. Compare your results to the metric masses you recorded in C2 step 3. ____ ____

7. DRILL: If you had trouble with any of the practical applications in section D2, find more things to measure. Measure them in customary units, convert your results to equivalent metric units, and check your answers by measuring the things again in metric units. Do this until you can convert from customary to metric units easily and accurately. ____ ____

D3. Converting Metric Measurements to Customary

1. DEMONSTRATE (with objects): Refer to DS #4934, section "Tables." Demonstrate each of the following conversions:

   a) centimeters to inches. ___

   b) meters to feet. ___

   c) meters to yards. ___

   d) kilometers to miles. ___ ____ ____

2. PRACTICAL APPLICATION: Convert the lengths you recorded in metric units in section A2, step 4 above to customary lengths. Compare your results to the customary lengths you recorded in A1 step 4. ____ ____

3. DEMONSTRATE (with objects): Refer to DS #4934, section "Tables." Demonstrate each of the following conversions:

   a) milliliters to fluid ounces. ___

   b) liters to pints. ___

   c) liters to quarts. ___

   d) liters to gallons. ___ ____ ____

4. PRACTICAL APPLICATION: Convert the volumes you recorded in metric units in section B2, step 3 above to customary volumes. Compare your results to the customary volumes you recorded in B1 step 4. ____ ____

5. DEMONSTRATE (with objects): Refer to DS #4934, section "Tables." Demonstrate each of the following conversions:

   a) grams to ounces. ___

   b) kilograms to pounds. ___ ____ ____

6. PRACTICAL APPLICATION: Convert the masses you recorded in metric units in section C2, step 3 to their equivalent customary weights. Compare your results to the customary weights you recorded in C1 step 4. ____ ____

7. DRILL: If you had trouble with any of the practical applications in section D3, find more things to measure. Measure them in metric units, convert your results to equivalent customary units, and check your answers by measuring the things again in customary units. Do this until you can convert from metric to customary units easily and accurately. ____ ____

E. FINAL APPLICATION SECTION

1. PRACTICAL APPLICATION: Get a container of unknown capacity. Using customary units, measure its height and width. Weigh it. Fill it with water and weigh it again. Measure the volume of the water it contains. Write down all your results and save them for later. **Supervisor pass.** ____ ____

2. PRACTICAL APPLICATION: Using the same container, redo the above measurements using metric units. Write down these results and save them for later. **Supervisor pass.** ____ ____

3. PRACTICAL APPLICATION: For steps 1 and 2 above, convert the results of your measurements in customary units (from step 1 above) to metric units. Convert the results of your measurements in metric units (from step 2 above) to customary units. Compare the results of your conversions with

your original measurements. Decide whether your results agree well enough, within the accuracy of your methods of measurements. _____

I have completed the steps of this course. I understand what I studied and can use it.

Student _____ Date _____

The student has completed the steps of this course and knows and can apply what was studied.

Supervisor _____ Date _____

This student has passed the exam for this course.

Examiner _____ Date _____