Name _____

Date _____

Measurement Madness!

The metric system provides the world with a universal system of measurement. Scientists all over the world have agreed upon this system. It was adopted in 1960 by the General Conference on Weights and Measures. It is a decimal system based on the powers of 10. It is very easy to convert one unit to another because all units are related to one another by a power of 10.

In this activity you will:
(1) Become familiar with the metric ruler.
(2) Practice taking measurements with a metric ruler.
(3) Practice converting between the units of the metric system.

Take a look at your metric ruler. You will see many tiny lines, and every so often a much longer line. The longer lines are centimeter (cm) marks, and the shorter lines are millimeter (mm) marks.

1. In the space below, draw a line that is 12 centimeters long. Put small marks on the line indicating each centimeter.

2. Draw a line that is 12 millimeters long.

3. What is the relationship between the lengths of these two lines?

4. How many millimeters are in one centimeter? _____

5. What part of a centimeter is one millimeter? _____

6. Below you will see three lines. With your metric ruler measure the length of each line in both centimeters and in millimeters.

   a) _____ Length in cm = _____ Length in mm = _____

   b) _____ Length in cm = _____ Length in mm = _____

   c) _____ Length in cm = _____

Length in mm = _____

7. The area of a figure can be determined by multiplying the length by the height of the figure. The length and height must be in the same unit of measurement. Use your metric ruler to measure the length and the height of each of the figures below.

Remember: All numerical measurements must be followed by a unit of measurement.
Incorrect way of recording a measurement: 10
Correct way of recording a measurement: 10 cm

a) Determine the area of this figure in centimeters:

Length = _____

Height = _____

Area = _____

b) Determine the area of this figure in millimeters:

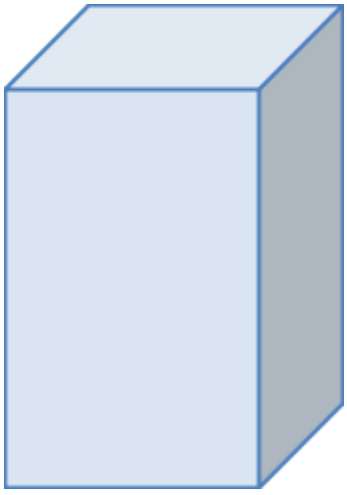
Length = _____

Height = _____

Area = _____

8. The volume of a figure can be determined by multiplying the length, width and height of the figure. The length, width and height must be in the same unit of measurement. Use your metric ruler to measure the length, width and the height of each of the figures below.

a) Determine the volume of this figure in centimeters:



Length = _____

Height = _____

Width = _____

Volume = _____

b) Determine the volume of this figure in millimeters:

Length = _____

Height = _____

Width = _____

Volume = _____

9. Now you should easily be able to answer the following:

   a) How do you change centimeters to millimeters? _____

   b) How do you change millimeters to centimeters? _____

10. Complete the following metric conversions:

   a) 694 mm □ ? m

   b) 0.59 kg □ ? cg

   c) 1,943,071 µL □ ? mL

   d) 115 dag □ ? dg

   e) .703 Mm □ ? mm

11. Although you may find the metric system new at first, it is not as different as you might think. The metric system can be used to measure anything, even things commonly measured in other units. For everyday measuring, we still use the English system of measurements. The English system uses units such as feet, pounds, and quarts. Use the table below to convert English units to metric units in the following problems.

2.54 centimeters = 1 inch	1 liter = 1.06 quarts
1 meter = 39.37 inches	1 kilogram = 2.2 pounds
1 kilometer = 0.62 miles	28.3 grams = 1 ounce

<u>Directions</u>: Read each paragraph. Complete the indicated conversions between the English and the metric system.

a) Madagascar Hissing Cockroaches are very unusual creatures. They are very large and make strange hissing noises that may be part of an elaborate mating behavior. They grow to be 7.5 cm (_____ inches) in length and may weigh 22.7 grams (_____ ounces). A small colony of these cockroaches can eat a large carrot in a single day.

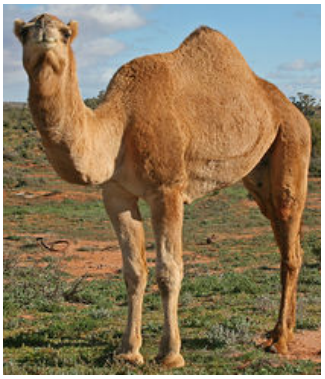
Show your work for both conversions here:

b) Whale sharks are the largest fish in the sea. They are sharks, but are considered to be "gentle giants." Being filter filters, they swim with their mouths open wide, collecting plankton and small fish. They may grow to be 32.8 feet (_____ m) in length and may weigh in at an enormous 41, 200 pounds (_____kg).

Show your work for both conversions here:

c) The cheetah is the world's fastest land animal. Amazingly, it can reach speeds of 96 kilometers (_____ miles) per hour in only three seconds.

Show your work here:



d) Camels have an amazing list of statistics. They can go for long periods of time without drinking any water. When they do drink, they can consume up to 150 liters (_____ quarts) of water at one time. They are also very fast runners, and can reach speeds of 40 miles (_____km) per hour. Contrary to popular belief, camels do not store water in their humps.

Show your work here:

12. You may have noticed that it is much easier to convert one metric unit to another metric unit than it is to convert between the English and the metric systems? Why is this true?

13. What is the connection between the metric units of length and volume?

14. Why is it difficult to convert between the units of the English system? In other words, why do people find it so difficult to convert miles to yards, feet or inches?

Measurement Madness – Answer Key

1. Student draws appropriate line on their paper.

2. Student draws appropriate line on their paper.

3. The 12 cm line is 10 times longer then the 12 mm line.

4. There are 10 millimeters in one centimeter.

5. A millimeter is $1/10^{th}$ of a centimeter.

6. a) The line is 6.1 cm and 61 mm in length.
   b) The line is 3.2 cm and 32 mm in length.
   c) The line is 11 cm and 110 mm in length.

7. a) Length = 5.7 cm Height = 2 cm Area = 11.4 cm^2

   b) Length = 67 mm Height = 21 mm Area = 1407 mm^2

8. a) Length = 3.3 cm Height = 5.2 cm Width = 1.5 cm Volume = 25.74 cm^3

   b) Length = 95 mm Height = 19 mm Width = 9 mm Volume = 16,245 mm^3

9. a) Multiply by 10
   b) Divide by 10

10. a) $\dfrac{694 \text{ mm} \quad 1 \text{ m}}{\qquad\quad 1000 \text{ mm}} = .694 \text{ m}$

    b) $\dfrac{.59 \text{ kg} \quad 1000 \text{ g} \quad 100 \text{ cg}}{\qquad\quad 1 \text{ kg} \qquad 1 \text{ g}} = 59{,}000 \text{ cg}$

    c) $\dfrac{1{,}943{,}071 \text{ µL} \quad 1 \text{ L} \quad 1000 \text{ mL}}{\qquad\qquad\quad 1{,}000{,}000 \text{ µL} \qquad 1 \text{ L}} = 1943.071 \text{ mL}$

d) $\frac{115 \text{ dag} \mid 10 \text{ g} \mid 10 \text{ dg}}{\quad \mid 1 \text{ dag} \mid 1 \text{ g}}$ = 11,500 dg

e) $\frac{.703 \text{ Mm} \mid 1{,}000{,}000 \text{ m} \mid 1000 \text{ mm}}{\quad \mid 1 \text{ Mm} \mid 1 \text{ m}}$ = 703,000,000 mm

11. a) 7.5 cm □ ? inches

$\frac{7.5 \text{ cm} \mid 1 \text{ inch}}{\quad \mid 2.54 \text{ cm}}$ = 2.95 inches

22.7 g □ ? ounces

$\frac{22.7 \text{ g} \mid 1 \text{ ounce}}{\quad \mid 28.3 \text{ g}}$ = .802 ounces

b) 32.8 ft □ ? meters

$\frac{32.8 \text{ ft} \mid 12 \text{ inches} \mid 1 \text{ m}}{\quad \mid 1 \text{ ft} \mid 39.37 \text{ inches}}$ = 9.997 m (10 meters)

41,200 lb □ ? kg

$\frac{41{,}200 \text{ lb} \mid 1 \text{ kg}}{\quad \mid 2.2 \text{ lb}}$ = 18,727.27 kg

c) 96 km □ ? miles

$\frac{96 \text{ km} \mid .62 \text{ miles}}{\quad \mid 1 \text{ km}}$ = 59.52 miles

d) 150 L □ ? quarts

$\frac{150 \text{ L} \mid 1.06 \text{ qts}}{\quad \mid}$ = 159 qts

1 L

40 miles ? ? km

$$\frac{40 \text{ miles} \mid 1 \text{ km}}{.62 \text{ miles}} = 64.52 \text{ km}$$

12. Metric units are based on powers of ten. English system units are not. It is much easier to multiply or divide by units of ten than it is by the arbitrary conversion factors of the English system.

13. Volume is a determined by multiplying three units of length together.

14. One has to remember that there are 12 inches in a foot, 3 feet in a yard, and 5280 feet in a mile. The conversions are not based on powers of ten and many people do not remember all of the conversions in the English system.