The Next Step
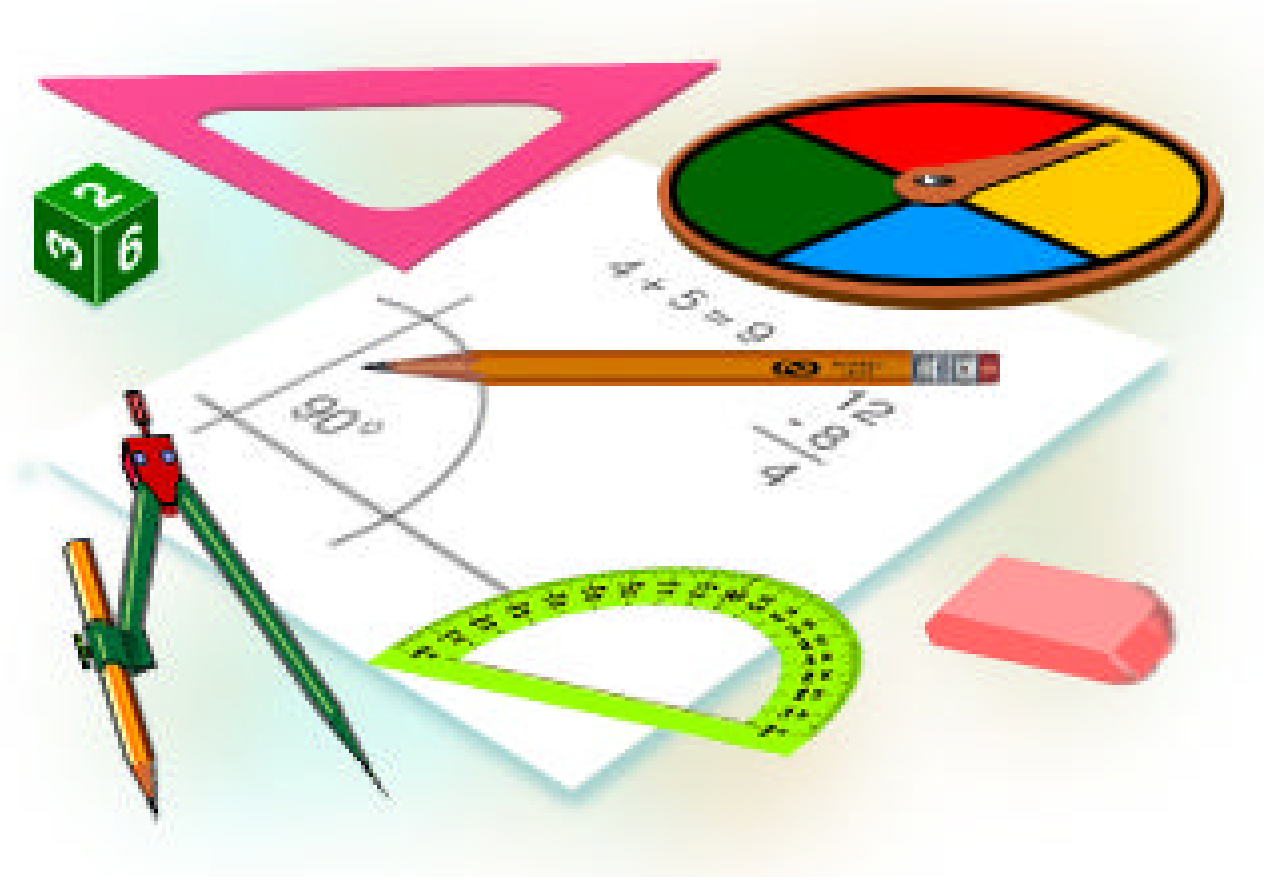
Mathematics Applications for Adults

Book 14017 - Measurement

OUTLINE

Mathematics - Book 14017

Measurement
The Metric System
use correct metric units to measure length, volume, capacity, mass, time, and temperature.
convert from any given metric unit to any stated metric unit.
Problem Solving Involving Measurement
solve multi-step problems requiring the performance of any combination of mathematical operations involving measurement, with or without a calculator.

THE NEXT STEP

Book 14017

Measurement

The Metric System

In the 1790s, French scientists worked out a system of measurement based on the *meter* which they called the Systeme International (International System). The meter is one ten-millionth of the distance between the North Pole and the Equator. The French scientists made a metal rod equal to the length of the standard meter.

By the 1980s, the French metal bar was no longer a precise measure for the meter. Scientists figured out a new standard for the meter. They made it equal to 1/299,792,548 of the distance light travels in a vacuum in one second. Since the speed of light in a vacuum never changes, the distance of the meter will not change.

The French scientists developed the *metric* system to cover measurement of length, area, volume, and weight.

Metric Length Equivalents

Metric Unit	Abbreviation	Metric Equivalent
millimeter	mm	.1 centimeter
centimeter	cm	10 millimeters
decimeter	dm	10 centimeters
meter	m	100 centimeters
dekameter	dam	10 meters
hectometer	hm	100 meters
kilometer	km	1000 meters

Metric Weight Equivalents

Metric Unit	Abbreviation	Metric Equivalent
milligram	mg	.001 gram
centigram	cg	10 milligrams
decigram	dg	10 centigrams
gram	g	1,000 milligrams
decagram	dag	10 grams
hectogram	hg	100 grams
kilogram	kg	1,000 grams

Metric Volume Measures

Metric Unit	Abbreviation	Metric Equivalent
milliliter	ml	.001 liter
centiliter	cl	10 milliliters
deciliter	dl	10 centiliters

liter	l	1,000 milliliters
dekaliter	dal	10 liters
hectoliter	hl	100 liters
kiloliter	kl	1,000 liters

Decimal Point
A period that separates the whole numbers from the fractional part of a number; or that separates dollars from cents
Example:
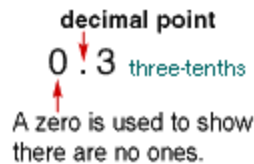
Kilometers	Hectometers	Decameters	Meters	Decimeters	Centimeters	Millimeters
Kilograms	Hectograms	Decagrams	Grams	Decigrams	Centigrams	Milligrams
Kiloliters	Hectoliters	Decaliters	Liters	Deciliters	Centiliters	Milliliters

To use the chart above, if a question asks you how many grams that you can get from 200 centigrams, for example, try this:

Start by putting down the number:

200

If we don't see a decimal point, the number is a whole number; and therefore, a decimal point may be inserted to the right of the last digit:

200.

Now, using your chart, start at centigrams and count back to grams (two spaces to the left).
Move the decimal point in your number the same amount of spaces in the same direction:

2.00

The answer to the question is that 200 centigrams is equal to 2 grams.

If a question asks you to tell how many millimeters are is 8.3 decimeters, try this:

Write down the number:

8.3

We already see a decimal point, so there is no need to guess where to place it:

8.3

Now, using your chart, start at decimeters and count forward to millimeters (two spaces to the right).

Move the decimal point in your number the same amount of spaces in the same direction:

830.

The answer to the question is that 830 millimeters is equal to 8.3 decimeters.

Þ Change larger to smaller units by multiplying.

3 meters = ? cm
3 x 100 (100 centimeters to a meter) = 300 centimeters

Þ Change smaller to larger units by dividing

5000 grams = ? kg
5000 ¸ 1000 grams = 5 kg

Practice Exercise

Fill in the answer.

1.   6.55 kl = _____ L

2.   7.7 cm = _____ mm

3.   10900 L = _____ kl

4.   628 cg = _____ g

5.   7.076 cg = _____ mg

6.   2570 L = _____ kl

7. 6.3 L =
_____ cl

8. 7559 L =
_____ kl

9. 60 mg =
_____ cg

10. 998 cl =
_____ L

11. 4 cl =
_____ ml

12. 9.99 kl =
_____ L

13. 5000 mm =
_____ m

14. 9.861 kl =
_____ L

15. 80 ml =
_____ cl

16. 4.65 kg =
_____ g

17. 3230 mm =
_____ m

18. 12.515 kl =
_____ L

19. 295.8 cl =
_____ L

20. 3.63 kg =
_____ g

21. 68 mm =
_____ cm

22. 1000 m =
_____ km

23. 8.68 g =
_____ mg

24. 10 ml =
_____ cl

25. 11340 g =
_____ kg

26. 1000 cm =
_____ m

27. 5.55 m =
_____ mm

28. 11.634 km =
_____ m

29. 444 cm =
_____ m

30. 20 mg =
_____ cg

31. 6400 g =

_____ kg

32. 8.582 g =

_____ mg

33. 6 kl =

_____ L

The Centigrade Scale

In 1742, Swedish astronomer Anders Celsius (1701 – 1744) invented a scale for measuring heat. His scale is called the *centigrade* or *Celsius* scale. Celsius's scale is based on the freezing and boiling points of water. The freezing point of water is equal to 0 degrees Celsius. The boiling point is 100 degrees Celsius. While the Fahrenheit scale is used in the United States, the centigrade scale is used in most countries throughout the world. It is the scale preferred by scientists.
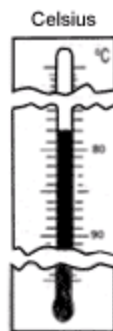
The markings on a thermometer are in degrees.
We read the degrees as:
above zero   +1, +2, +3, ……
below zero   -1, -2, -3, ……..

The temperature on the Celsius thermometer below is -78 degrees. This can be written as -78℃.

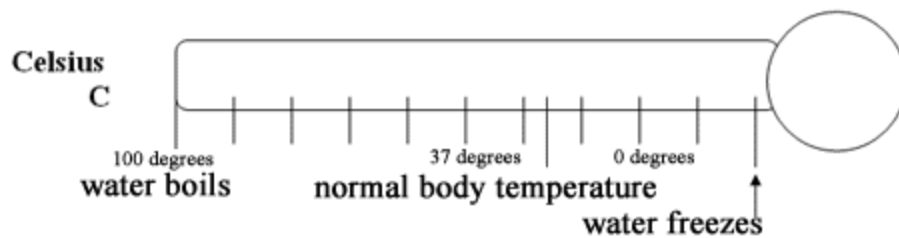Celsius

A degree Celsius memory device:

There are several **memory aids** that can be used to help the novice understand the degree Celsius temperature scale.
One such device is:

*When it's **zero** it's **freezing**,*
*when it's **10** it's **not**,*
*when it's **20** it's **warm**,*
*when it's **30** it's **hot**!*

Or, another one to remember:

30's hot
20's nice
10's cold
zero's ice

Celsius
C

100 degrees   37 degrees   0 degrees
water boils   normal body temperature
                                     water freezes

Practice Exercise

Find the result for each temperature change.

1. Current temperature: 72 °C
   Change: 12 degree drop

2. Current temperature: 38 °C
   Change: 10 degree increase

3. Current temperature: 36 °C
   Change: 17 degree drop

4. Current temperature: 25 °C
   Change: 6 degree drop

5. Current temperature: 5 °C
   Change: 8 degree drop

6. Current temperature: -14 °C
   Change: 7 degree increase

Problem Solving Involving Measurement

1. George used 22 ½ centimeters of copper wire in each appliance he repaired. If he fixed eight appliances, how many meters of copper wire did he use?

2. Patricia works in a nursing home. She makes sure her patients drink at least 2,000 milliliters of water every day. How many liters of water should each patient drink?

3. Joe and Jane were dehydrated after playing ball in the hot sun all day. The nurse gave each of them ¼ liter of fluid. How many milliliters of fluid did each child receive?

4. A nutrition label on a can of mixed nuts says the fat content is 9 grams per serving and the sodium is 400 milligrams per serving. Which amount is smaller?

5. Sara plans to eat at least 32,500 milligrams of fiber daily. How many grams of fiber does she plan to eat daily?

6. A weather report says that the evening temperature is 12 degrees Celsius and that the temperature will fall 17 degrees during the night. What is the coldest temperature expected during the night?

7. The distance between two towns is 15.83 kilometers. What is the distance, in meters, between the two towns?

Answer Key

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Page 7   **1.** 6550 L   **2.** 77 mm   **3.** 10.9 kl
    4. 6.28 g   **5.** 70.76 mg   **6.** 2.57 kl
    7. 630 cl   **8.** 7.559 kl   **9.** 6 cg
    10. 9.98 L   **11.** 40 ml   **12.** 9990 L
    13. 5 m   **14.** 9861 L   **15.** 8 cl   **16.** 4650 g
    17. 3.23 m   **18.** 12515 L   **19.** 2.958 L
    20. 3630 g   **21.** 6.8 cm   **22.** 1 km
    23. 8680 mg   **24.** 1 cl   **25.** 11.34 kg
    26. 10 m   **27.** 5550 mm   **28.** 11634 m
    29. 4.44 m   **30.** 2 cg   **31.** 6.4 kg
    32. 8582 mg   **33.** 6000 L

Page 11   **1.** 60 ℃   **2.** 48 ℃   **3.** 19 ℃   **4.** 19 ℃
    5. –3 ℃   **6.** –7 ℃

Page 12   **1.** 1.8 meters   **2.** 2 liters   **3.** 250 ml each
    4. 400 mg   **5.** 32.5 grams   **6.** –5 ℃
    7. 15830 meters