

A Formula for SI Catch-up

Scientists use SI all the time. But most people in the United States still use non-SI units. So what do you do if you have data in non-SI units and you want to convert the data into SI units, or vice versa? Have no fear! Conversion charts, like the one shown below, can help you accomplish the task with ease.

SI Conversion Chart

From (non-SI)	SI Equivalent	To (SI)
Inches (in.)	2.54	centimeters (cm)
feet (ft)	30.50	centimeters (cm)
yards (yd)	0.91	meters (m)
miles (mi)	1.61	kilometers (km)
ounces (oz)	28.35	grams (g)
pounds (lb)	0.45	kilograms (kg)
fluid ounces (fl oz)	29.57	milliliters (ml)
cups (c)	0.24	liters (l)
pints (pt)	0.47	liters (l)
quarts (qt)	0.94	liters (l)
gallons (gal)	3.79	liters (l)

PROCEDURE: To convert from non-SI units to SI units, find the non-SI unit in the left column and multiply it by the number in the center column. The resulting number will be in the SI unit in the right column.

To convert a SI unit into a non-SI unit, find the SI unit in the right column and divide by the number in the center column to get the non-SI unit on the left.

SAMPLE PROBLEM: Convert 15 gal into liters (L).
 $15 \times 3.79 = 56.85 \text{ L}$

Complete the Conversions!

Use the SI conversion chart to do the following conversions (round to the nearest hundredths):

- a. 15 oz = _____ g
- b. 40 cm = _____ in.
- c. 2 c = _____ L
- d. 27 m = _____ yd
- e. 5.5 gal = _____ L
- f. 115 lb = _____ kg

Convert between degrees Fahrenheit and degrees Celsius.

Do you remember the last time you had your temperature taken? Your body temperature is usually about 98.6°F. This temperature is in degrees Fahrenheit (°F). The Fahrenheit temperature scale is a common temperature scale. In science class, however, a scale known as the Celsius (°C) scale is used. Temperatures in one scale can be mathematically converted to the other system using one of the equations below.

EQUATIONS: Conversion from Fahrenheit to Celsius: $\frac{5}{9} \times (°F - 32) = °C$

Conversion from Celsius to Fahrenheit: $\frac{9}{5} \times °C + 32 = °F$

SAMPLE PROBLEMS:

- A. Convert 59°F to degrees Celsius.
- B. Convert 112°C to degrees Fahrenheit.

$$°C = \frac{5}{9} \times (°F - 32)$$

$$°C = \frac{5}{9} \times (59 - 32)$$

$$°C = \frac{5}{9} \times 27$$

$$°C = 15°C$$

$$°F = \frac{9}{5} \times °C + 32$$

$$°F = \frac{9}{5} \times 112 + 32$$

$$°F = 20\frac{3}{5} + 32$$

$$°F = 233\frac{3}{5}°F$$

Turn Up the Temperature!

1. Convert the following temperatures from degrees Fahrenheit to degrees Celsius:

- a. 98.6°F _____
- b. 482°F _____
- c. -4°F _____

2. Convert the following temperatures from degrees Celsius to degrees Fahrenheit:

- a. 24°C _____
- b. 17°C _____
- c. 0°C _____

Challenge Yourself!

- 3. Convert $2.7 \times 10^4°C$ to degrees Fahrenheit. _____

What is S17 continued

Finding Perimeter and Area, continued

Part 2: Calculating Area

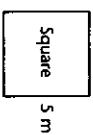
Now that you know how to find the perimeter of the garden, you are ready to plan what to grow. How much planting soil will you need? How many plants will fit in the garden? To answer these questions, you will need to know the area of the garden. **Area (A)** is the number of square units needed to cover the surface of a figure. The equations below will help you find the area of some common figures.

EQUATIONS: Area of a square = side × side

Area of a rectangle = length × width

Area of a triangle = $\frac{1}{2}$ × base × height

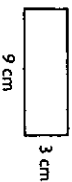
SAMPLE PROBLEMS: Find the area (A) of each of the following figures:



A = side × side

A = 5 m × 5 m

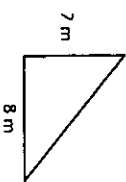
A = 25 m²



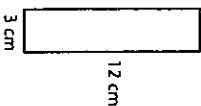
A = length × width

A = 9 cm × 3 cm

A = 27 cm²

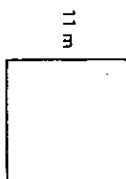


a.



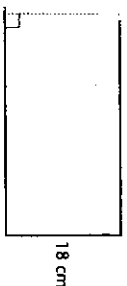
b.

A = _____



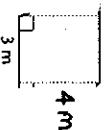
c.

A = _____



d.

A = _____



e.

A = _____

A = _____

A = _____

WORKSHEET
32 **MATH IN SCIENCE: INTEGRATED SCIENCE**

Density

Calculate density, and identify substances using a density chart.

Density is a measure of the amount of mass in a certain volume. This physical property is often used to identify and classify substances. It is usually expressed in grams per cubic centimeters, or g/cm³. The chart on the right lists the densities of some common materials.

EQUATION: density = $\frac{\text{mass}}{\text{volume}}$

$D = \frac{m}{V}$

SAMPLE PROBLEM: What is the density of a billiard ball that has a volume of 100 cm³ and a mass of 250 g?

$D = \frac{250 \text{ g}}{100 \text{ cm}^3}$
 $D = 2.5 \text{ g/cm}^3$

Your Turn!

1. A loaf of bread has a volume of 2270 cm³ and a mass of 454 g. What is the density of the bread?

2. A liter of water has a mass of 1000 g. What is the density of water? (Hint: 1 mL = 1 cm³)

3. A block of wood has a density of 0.6 g/cm³ and a volume of 1.2 cm³. What is the mass of the block of wood? Be careful!

4. Use the data below to calculate the density of each unknown substance. Then use the density chart above to determine the identity of each substance.

Mass (g)	Volume (cm ³)	Density (g/cm ³)	Substance
Example: 4725	350	$4725 \div 350 = 13.5$	Mercury
a. 171	15	_____	_____
b. 108	40	_____	_____
c. 475	250	_____	_____
d. 680	1000	_____	_____

Densities of Substances

Substance	Density (g/cm ³)
Gold	19.3
Mercury	13.5
Lead	11.4
Iron	7.87
Aluminum	2.7
Bone	1.7–2.0
Gasoline	0.66–0.69
Air (dry)	0.00119

WORD SEARCH
Multiplication
Division
Decimals

Average, Mode, and Median

Although an average, or mean, is the most common way to simplify a list of numbers, there are other mathematical tools that can help you work with lists of numbers. **Mode** is the number or value that appears most often in a particular set of numbers. **Median** is the number that falls in the *numerical center* of a list of numbers. Read on to find out how to find mode and median.

PROCEDURE: To find the mode, list your numbers in numerical order. Then determine which number appears most often in the set. That number is the mode. Note: A list of numbers may have more than one mode. If no number appears more often than the others, that series of numbers does not have a mode.

SAMPLE PROBLEM: Find the mode of 4, 3, 6, 10, and 3.

Step 1: List the numbers in numerical order.
3, 3, 4, 6, 10

Step 2: Determine the number that appears most often in the set.
3, 3, 4, 6, 10

The mode of 4, 3, 6, 10, and 3 is **3**.

PROCEDURE: To find the median, list the numbers in numerical order. Next determine the number that appears in the middle of the set. Note: If more than one number falls in the middle, the median is the average of those numbers.

SAMPLE PROBLEM: Find the median of 25, 22, 24, 19, 25, 14, 26, and 15.

Step 1: List the numbers in numerical order.
14, 15, 19, 22, 24, 25, 25, 26

Step 2: Determine which number falls in the middle of the set.
14, 15, 19, 22, 24, 25, 25, 26

Because two numbers fall in the middle (22 and 24), the median is their average.
Median = $(22 + 24) \div 2 = 23$

Get in the Mode!

1. Find the mode and median for the following sets of numbers:

a. 37, 30, 35, 37, 32, 40, 34

Mode _____ Median _____

b. 19, 29, 9, 12, 10

Mode _____ Median _____

c. 109, 84, 88, 107, 84, 94

Mode _____ Median _____

d. 26, 53, 39, 53, 49, 56, 35, 26

e. 25 m, 24 m, 27 m, 27 m, 49 m, 47 m, 45 m

Mode _____ Median _____

f. 98 L, 99 L, 101 L, 111 L, 132 L, 103 L

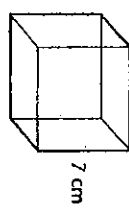
Mode _____ Median _____

Finding Volume

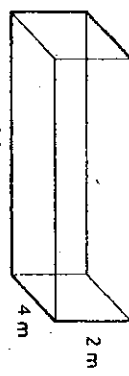
Volume (V) is the amount of space something occupies. It is expressed in cubic units, such as cubic meters (m³) and cubic centimeters (cm³). Use the equations for volume below to calculate the volume of cubes and prisms.

EQUATIONS: Volume of a cube = side \times side \times side
Volume of a prism = area of base \times height

SAMPLE PROBLEMS: Find the volume (V) of the solids.



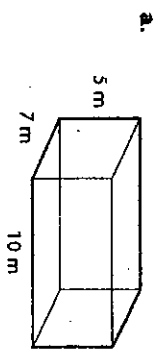
$V = \text{side} \times \text{side} \times \text{side}$
 $V = 7 \text{ cm} \times 7 \text{ cm} \times 7 \text{ cm}$
 $V = 343 \text{ cm}^3$



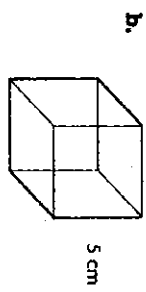
$V = \text{area of base} \times \text{height}$
 $V = (\text{length} \times \text{width}) \times \text{height}$
 $V = (16 \text{ m} \times 4 \text{ m}) \times 2 \text{ m}$
 $V = 64 \text{ m}^2 \times 2 \text{ m}$
 $V = 128 \text{ m}^3$

Turn Up the Volume!

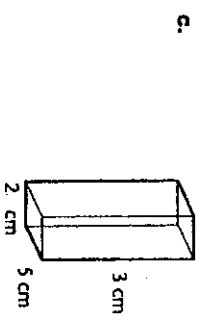
1. Find the volume of the solids.



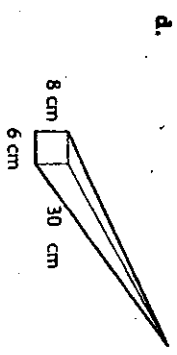
$V =$ _____



$V =$ _____



$V =$ _____



$V =$ _____

What Is an Average?

Suppose that your class is doing an experiment to determine the boiling point of a particular liquid. Working in groups, your classmates come up with several answers that are all slightly different. Your teacher asks you to determine which temperature best represents all of the varying results from the class. A mathematical tool called an *average*, or *mean*, will help you solve the problem. An average allows you to simplify a list of numbers into a single number that *approximates* the value of all of them. Check it out!

PROCEDURE: To calculate the average of any set of numbers, first add all of the numbers to find the sum. Then divide the sum by the amount of numbers in your set. The result is the average of your numbers.

SAMPLE PROBLEM: Find the average of the following set of numbers:

5, 4, 7, 8

Step 1: Find the sum.

$$5 + 4 + 7 + 8 = 24$$

Step 2: Divide the sum by the amount of numbers in your set. Because there are four numbers in your set, divide the sum by 4.

$$24 \div 4 = 6 \text{ or } \frac{24}{4} = 6$$

The average of the numbers is 6.

Practice Your Skills!

Be sure to show your work for the following problems:

1. Find the average of each of the following sets of numbers.

a. 19 m, 11 m, 29 m, 62 m, 14 m

b. 12 cm, 16 cm, 25 cm, 15 cm

c. 31°C, 42°C, 35°C, 38°C, 59°C

What is an Average? continued

Use the data in the tables to complete the following problems. Be sure to show your work.

Height of Students (cm)

Students	Grade 6	Grade 7	Grade 8	Grade 9
Gretchen	152	156	159	163
Dylan	151	152	157	162
Sergio	144	147	150	152

2. Calculate the average of Gretchen's and Dylan's heights in the 8th grade.

3. What is the average height of all three students in Grade 6?

Number of Wildfires in 1993-1996

Year	Arizona	New Mexico	Oklahoma	Texas
1993	10	7	17	85
1994	16	11	24	84
1995	12	5	7	72
1996	13	5	37	91

4. What was the average number of wildfires to occur annually in New Mexico for the years 1993-1996?

5. What was the average number of wildfires for all four states in 1995?

6. What was the average number of wildfires to occur annually in Texas for the years 1993-1996?
