

Math 2303
Section 1.6 and 1.7
Temperature, Area, Volume and Unit Conversion

Temperature

C - Celsius Fahrenheit - °F

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

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

Celsius Scale

Freezing Point of Water

$$0^{\circ}\text{C}$$

Boiling Point of Water

$$100^{\circ}\text{C}$$

Converting

Example 7: Use the temperature conversion formulas to convert the following temperatures in degrees Fahrenheit into degrees Celsius.

$$350 = F$$

a. 80°F

b. 40°F

c. 350°F

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

$$C = \frac{5}{9}(80 - 32) = 26.7^{\circ}\text{C}$$

$$C = \frac{5}{9}(350 - 32) = 176.7^{\circ}\text{C}$$

$$F = 80$$

$$F = 40$$

$$C = \frac{5}{9}(40 - 32) = 4.4$$

Example 8: Convert the following Celsius temperatures into temperatures in degrees Fahrenheit.

a. 50°C

b. 25°C

c. -10°C

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

$$a) \quad = \frac{9}{5}(50) + 32$$

$$F = 122$$

$$C = 25$$

$$F = \frac{9}{5} \cdot 25 + 32$$

$$= 77$$

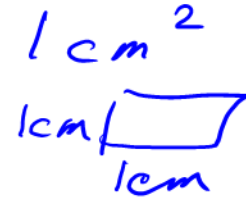
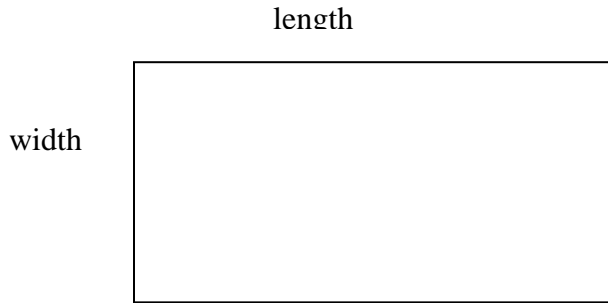
$$C = -10$$

$$F = \frac{9}{5}(-10) + 32 = 14$$

Area Units

Square length units –

Rectangle The area of a rectangle is calculated by the formula:



$$\text{Area} = \text{Length} \times \text{Width}$$

To use this formula to calculate the area of a rectangular (or square) region in the plane in a square metric unit:

1. Convert the width and length of the rectangle to the appropriate unit.
2. Multiply the width times the length and express your answer in square units.

My laptop screen is 30 cm wide by 19 cm high. What is the area
In square centimeters?

$$\begin{aligned} \text{Area} &= 30 \times 19 \text{ cm}^2 \\ &= 570 \text{ cm}^2 \end{aligned}$$

In square decimeters?

	meter	deci	centi
	1 m	10 dm	= 100 cm
			← 1 unit

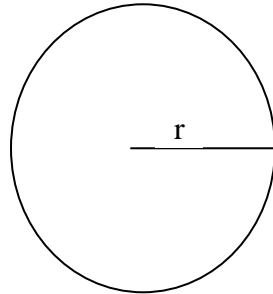
Dimensions

$$\begin{aligned} 30 \text{ cm} &= 3.0 \text{ dm} \\ 19 \text{ cm} &= 1.9 \text{ dm} \end{aligned}$$

$$\begin{aligned} \text{Area} &= 3 \times 1.9 \text{ dm}^2 \\ &= 5.7 \text{ dm}^2 \end{aligned}$$

$$\begin{aligned} 570 \text{ cm}^2 &= 5.7 \text{ dm}^2 \\ &= .057 \text{ m}^2 \end{aligned}$$

The area of a circle can also be found by the formula $A = \pi r^2$, where r is the radius of the circle and π is approximately 3.14 (or use the π key on your calculator).



Find the area of a circle of radius 0.25 meters:

In square meters – $r = .25$
 $A \text{ m}^2 = \pi (.25)^2 = .196 \text{ m}^2$

In square centimeters – $0.25 \text{ m} = 25 \text{ cm}$
 $\text{m} \xrightarrow{\text{dm}} \text{cm}$
 $\text{dm} \xrightarrow{2} \text{cm}$

$$A = \pi \cdot 25^2 = 1963 \text{ cm}^2$$
$$.196 \text{ m}^2 = 1963 \text{ cm}^2$$

$10^4 = 10,000$
times bigger
number

Volume –

The metric unit for volume is the liter. However, volume is often calculated from the dimensions of a solid in cubic length units. The volume of 1 cubic meter is the volume of a cube with sides of length 1 meter. The volume of 1 cubic decimeter is the volume of a cube with sides of length 1 decimeter. The liter is equal to 1 cubic decimeter.

The general convention is that volume of liquids is expressed in liters and volume of solids is expressed in cubic length units.

Scale –

One centimeter cubed –

 - cube of sugar

One decimeter cubed –

$1 \text{ dm}^3 = 1 \text{ liter}$

10 times larger cm

1000 sugar cubes in 1 dm^3

Notice the scale

Rectangular Box

Volume of a rectangular box is length times width times height.

Convert each dimension to the appropriate unit – then multiply

Cylinder

The formula for the volume of a cylinder with height h and radius r is $V = \pi r^2 h$.

Example – a soda can in the shape of a cylinder has height 12 cm and radius 3 cm. Find the volume of the can in cubic centimeter.

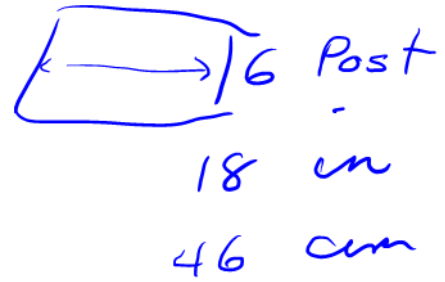
Dimensions cm

Plug in numbers

$$\begin{aligned} V &= \pi r^2 h \\ &= \pi \cdot (3)^2 \cdot 12 \\ &= 339 \text{ cm}^3 \end{aligned}$$

$$1 \text{ cm}^3 = 1 \text{ ml}$$

Unit Comparison –



Activity 7

1 Post is the length of one yellow post-it note.

1 square post is the area of one square yellow post it note.

- Find the approximate dimensions of your desh in Posts.
- Find the approximate area of your desk in square Posts.
- Find the approximate area of your desk in square inches.
- Find the approximate area of your desk in square centimeters.
- Write a unit fraction that represents the equivalent measures in square Posts and square inches.
- Write a unit fraction that represents the equivalent measures in square Posts and square centimeters.

Equivalent Units

US Customary System Units

1 foot (ft)	12 inches (in)
1 yard (yd)	3 feet
1 mile (mi)	5280 feet
1 pound (lb)	16 ounces
1 ton (T)	2000 pounds
1 cup (c)	8 fluid ounces
1 pint (pt)	2 cups
1 quart (qt)	2 pints
1 gallon (gal)	4 quarts

Metric – US Customary System Equivalences

US Customary System and Metric System Conversion Chart

Length	
1 inch	2.54 centimeters
1 foot	30.5 centimeters
1 yard	0.9 meters
1 mile	1.6 kilometers
Area	
1 in ²	6.5 cm ²
1 ft ²	0.09 m ²
1 yd ²	0.8 m ²
1 mi ²	2.6 km ²
1 acre	0.4 hectare (ha)
Volume	
1 teaspoon (tsp)	5 milliliters
1 tablespoon (tbsp)	15 milliliters
1 fluid ounce	30 milliliters

1 cup	0.24 liters
1 pint	0.47 liters
1 quart	0.95 liters
1 gallon	3.8 liters
1 cubic foot	0.03 cubic meters
1 cubic yard	0.76 cubic meters
Weight (Mass)	
1 ounce	28 grams
1 pound	0.45 kilograms
1 ton (T)	0.9 tonne (t)

UNIT FRACTION

equal

$$\frac{1 \text{ in}}{2.54 \text{ cm}}$$

$$\frac{12 \text{ in}}{1 \text{ ft}}$$

$$\frac{1 \text{ ft}}{12 \text{ in}}$$

$$\frac{6 \text{ Post}}{18 \text{ in}}$$