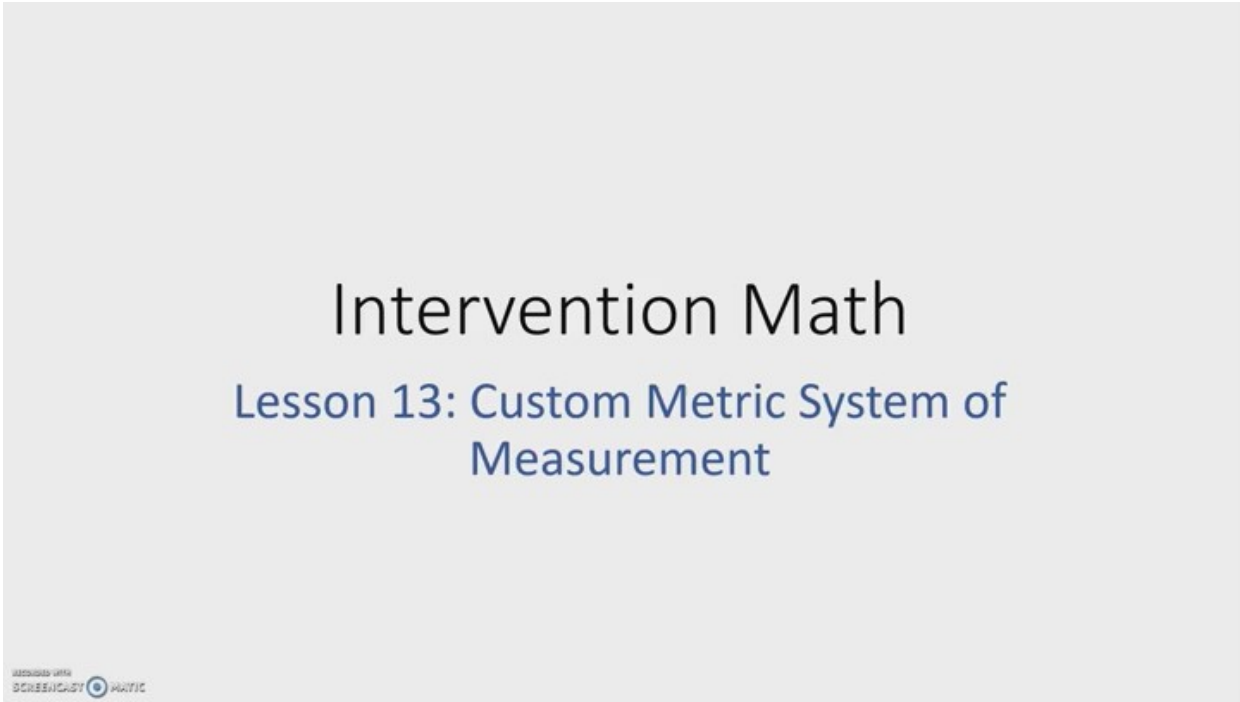


[PDF](#)

## **CUSTOMARY SYSTEM OF MEASUREMENT**

This unit is a review of the customary system of measurement. Topics discussed in this unit include conversions within the customary system and also between the customary and metric systems, measuring to the nearest sixteenth of an inch, converting temperatures between the Fahrenheit and Celsius systems, and examining applications of calculating elapsed time.

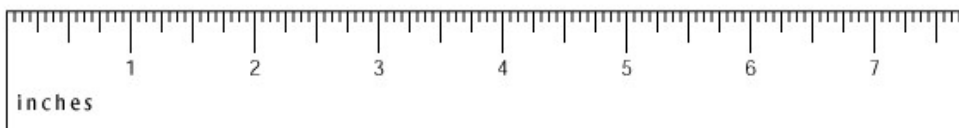


Intervention Math  
Lesson 13: Custom Metric System of  
Measurement

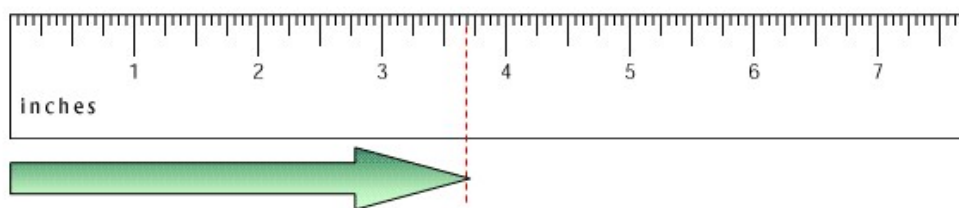
## Measuring to the Nearest Sixteenth of an Inch

This ruler is divided into 16ths of an inch.

To measure to the nearest 16th, count the spaces from the beginning of one whole inch up to and including the mark of the measurement. Write the measurement in 16ths, and then reduce if possible.

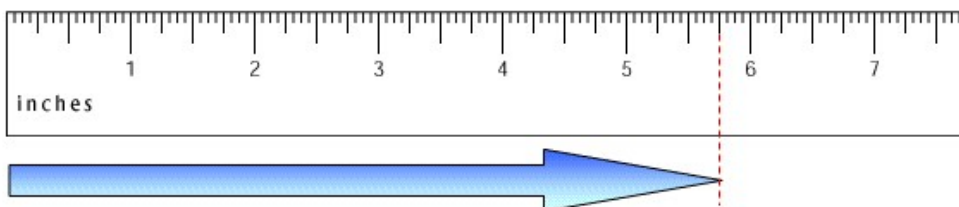


*Example 1:* How long is the arrow to the nearest 16th of an inch?



The arrow's tip falls on  $\frac{11}{16}$  beyond 3 inches; therefore, the arrow's length is  $3\frac{11}{16}$  inches.

*Example 2:* How long is the arrow to the nearest 16th of an inch?



The arrow's tip falls on  $\frac{12}{16}$  beyond 5 inches; thus, the arrow's length is  $5\frac{12}{16}$  inches which reduces to  $5\frac{3}{4}$ .  $\left[ 5\frac{12}{16} \div \frac{4}{4} = 5\frac{3}{4} \right]$

## Customary and Metric Conversions

Units of Length	Customary Unit Equivalence	Metric Unit Equivalence
-----------------	----------------------------	-------------------------

1 foot (ft)	12 inches (in)	30.48 cm
1 yard (yd)		0.91 m
1 mile (mi)		1.61 km

Units of Weight		Metric Unit Equivalence
1 ounce (oz)		28.35 g
1 pound (lb)	16 ounces (oz)	0.45 kg
1 ton (T)	2000 lb	907.18 kg



Practice Worksheet: Customary Units Conversions  
 Answer Key (Password Protected)



Practice Worksheet: Add and Subtract Customary Units  
 Answer Key (Password Protected)

Units of Capacity	Customary Unit Equivalence	Metric Unit Equivalence
1 fluid ounce (fl oz)		29.57 ml

## Customary Units of Area

Use the table of customary units of area to find equivalent areas in solving the problems that follow.

Unit	Abbreviation	Customary Unit Equivalence	Metric Unit Equivalence
square mile	sq mi or mi <sup>2</sup>	1 sq mi = 640 acres 1 sq mi = 102,400 rd <sup>2</sup>	
acre		1 acre = 4840 yd <sup>2</sup> 1 acre = 43,560 ft <sup>2</sup>	1 acre = 0.407 hectares
square rod	sq rd or rd <sup>2</sup>	1 sq rd = 30.25 yd <sup>2</sup> 1 sq rd = 0.006 acres	
square yard	sq yd or yd <sup>2</sup>	1 sq yd = 1296 in <sup>2</sup> 1 sq yd = 9 ft <sup>2</sup>	1 sq yd = 0.836 square meters
square foot	sq ft or ft <sup>2</sup>	1 sq ft = 144 in <sup>2</sup> 1 sq ft = 0.111 yd <sup>2</sup>	
square inch	sq in or in <sup>2</sup>	1 sq in = 0.007 ft <sup>2</sup> 1 sq in = 0.00077 yd <sup>2</sup>	1 sq in = 6.4516 sq cm

*Example 1:* Set up a proportion to convert the following measurement of area.

5 square yards =   ? square feet

From the conversion chart ... 1 yd<sup>2</sup> = 9 ft<sup>2</sup>

1 yd <sup>2</sup>	=	9 ft <sup>2</sup>
-------------------	---	-------------------

square yard	sq yd or yd <sup>2</sup>	1 sq yd = 1296 in <sup>2</sup> 1 sq yd = 9 ft <sup>2</sup>	1 sq yd = 0.836 square meters
-------------	--------------------------	---	-------------------------------

Set up a proportion comparing square yards to square feet.

$$\frac{\text{yd}^2}{\text{ft}^2} \rightarrow$$

$$\begin{aligned} \frac{1}{9} &= \frac{5}{x} \\ (1)x &= 9(5) \\ x &= 45 \end{aligned}$$

Five square yards equal 45 square feet.

*Example 2:* Set up a proportion to convert the following measurement of area.

$$14,520 \text{ square yards} = \underline{\quad ? \quad} \text{ acres}$$

acre	1 acre = 4840 yd <sup>2</sup> 1 acre = 43,560 ft <sup>2</sup>	1 acre = 0.407 hectares
------	--	-------------------------

From the conversion chart ... 1 acre = 4840 yd<sup>2</sup>

Set up a proportion comparing acres to square yards.

$$\frac{\text{acre}}{\text{yd}^2} \rightarrow \frac{1 \text{ acre}}{4840 \text{ yd}^2} = \frac{? \text{ acres}}{14,520 \text{ yd}^2}$$

$$\begin{aligned} \frac{1}{4840} &= \frac{x}{14520} \\ (4840)x &= 1(14520) && \text{Cross multiply} \\ 4840x &= 14520 && \text{Simplify} \\ \frac{4840x}{4840} &= \frac{14520}{4840} && \text{Divide both sides by 4840} \\ 1x &= 3 && \text{Simplify (1x = x)} \\ x &= 3 \end{aligned}$$

Three acres equal 14,520 square yards.

## Customary Units of Volume

Use the table of customary units of capacity to find an equivalent measure of capacity in solving the problem that follows.

Unit	Abbreviation	Customary Unit Equivalence	Metric Unit Equivalence
cubic yard	cu yd or yd <sup>3</sup>	1 cu yd = 27 ft <sup>3</sup> 1 cu yd = 46,656 in <sup>3</sup>	1 cu yd = 0.7646 cubic meter
cubic foot	cu ft or ft <sup>3</sup>	1 cu ft = 1728 in <sup>3</sup> 1 cu ft = 0.0370 yd <sup>3</sup>	
cubic inch	cu in or in <sup>3</sup>	1 cu in = 0.00058 ft <sup>3</sup> 1 cu in = 0.000021 yd <sup>3</sup>	1 cu in = 16.39 millimeters

*Example:* Set up a proportion to convert the following measurement of capacity.

$$8 \text{ cubic yards} = \underline{\quad ? \quad} \text{ cubic feet}$$

cubic yard	cu yd or yd <sup>3</sup>	1 cu yd = 27 ft <sup>3</sup> 1 cu yd = 46,656 in <sup>3</sup>	1 cu yd = 0.7646 cubic meter
------------	--------------------------	--	------------------------------

From the conversion chart ... 1 cubic yard = 27 ft<sup>3</sup>

Set up a proportion comparing cubic yards to cubic feet.

$$\frac{\text{yd}^3}{\text{ft}^3} \rightarrow \frac{1 \text{ yd}^3}{27 \text{ ft}^3} = \frac{8 \text{ yd}^3}{? \text{ ft}^3}$$

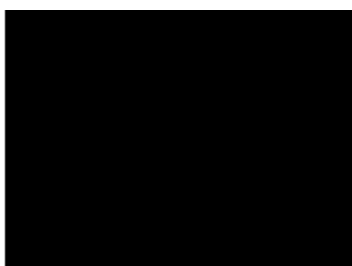
$$\frac{1}{27} = \frac{8}{x}$$

$$(1)x = 27(8) \quad \text{Cross multiply}$$

$$x = 216 \quad \text{Simplify}$$

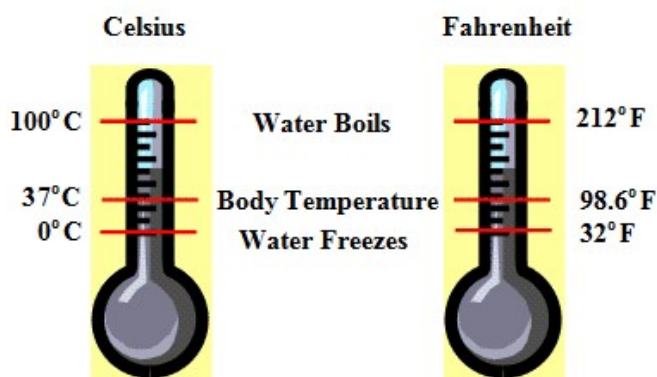
Eight cubic yards equal 216 cubic feet.





## Temperature

Temperature is commonly measured in Celsius (C) degrees or Fahrenheit (F) degrees. A comparison of a Celsius thermometer and a Fahrenheit thermometer are shown below.



The following formulas can be used to convert from one temperature scale to the other, and vice versa.

- **Celsius to Fahrenheit:**  $F = \frac{9}{5} \times C + 32$
- **Fahrenheit to Celsius:**  $C = \frac{5}{9} \times (F - 32)$

*Example 1:* Sheila and her friends went to Daytona Beach for spring break. Sheila sent a post card to her parents and told them that the temperature was averaging about 25° C throughout the day. What was the equivalent temperature in Fahrenheit degrees?

*Convert from Celsius to Fahrenheit:*

➡  $F = \frac{9}{5} \times C + 32$

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

Replace *C* with 25



$$F = \frac{9}{1} \times \frac{25}{1} + 32$$

$$F = \frac{9 \times 5}{1 \times 1} + 32$$

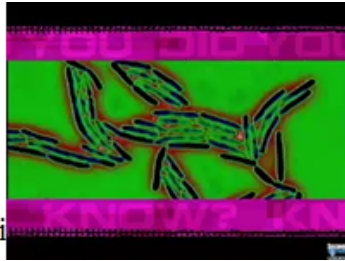
$$F = \frac{45}{1} + 32$$

$$F = 45 + 32$$

$$F = 77^\circ$$



Simplify



Twenty-five degrees Celsius is equal to 77 degrees Fahrenheit.



Practice Worksheet: Temperature Conversions

Example 2: On a cold winter day, the Fahrenheit thermometer registered  $20^\circ$  F.

What was temperature on the Celsius



## Time

Units of time are the same in customary and metric systems. The most common units of time are shown below.

Units of Time	
1 day (d)	= 24 hours (h)
1 hour (h)	= 60 minutes (min)
1 minute (min)	= 60 seconds (s)

To convert units of time, determine if the change is from *larger to smaller* units or *smaller to larger* units.

- *Multiply* to express larger units as smaller units.
- *Divide* to express smaller units as larger units.

Example 1: Change  $6\frac{1}{2}$  hours to minutes.

1 hour (h)	= 60 minutes (min)
------------	--------------------

hours  $\longleftrightarrow$  minutes



Practice Worksheet: Elapsed Time smaller  
 Answer Key (Password Protected)

Therefore, MULTIPLY by 60.

$$6\frac{1}{2} \times 60 = 6.5 \times 60 = 390$$

Four and one-half hours equal 390 minutes.

*Example 2:* Change 585 seconds to minutes.

1 minute (min)	= 60 seconds (s)
----------------	------------------

seconds  $\longleftrightarrow$  minutes

smaller  $\longleftrightarrow$  larger

Therefore, DIVIDE by 60.

$$585 \div 60 = 60 \overline{)585.00} = 9.75 \text{ or } 9\frac{3}{4}$$

$$\begin{array}{r} 9.75 \\ 60 \overline{)585.00} \\ \underline{540} \phantom{00} \\ 450 \phantom{00} \\ \underline{420} \phantom{00} \\ 300 \phantom{00} \\ \underline{300} \phantom{00} \\ 0000 \end{array}$$

Five hundred eight-five seconds equal  $9\frac{3}{4}$  minutes.

Calculating elapsed time is used in everyday job settings such as clocking in and out for a day's work or planning a schedule for the workday. Finding hours worked from time cards is similar to finding elapsed time.

One way to find elapsed time is using 24-hour notation. This method is useful because no adjustments are needed for AM and PM changes in the same 24-hour day.

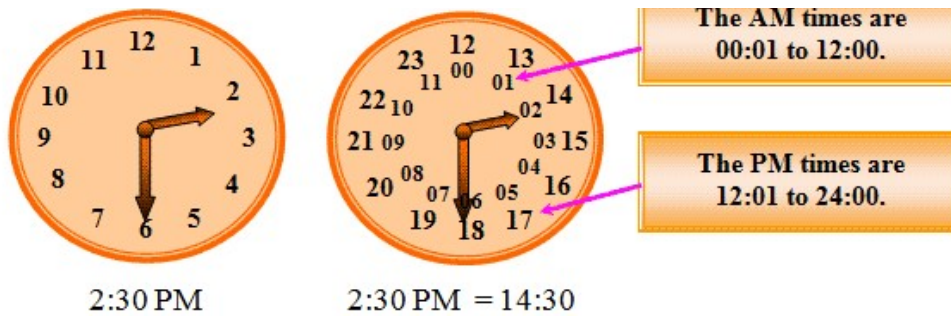
The illustration below compares a 12-hour clock to a 24-hour clock. The morning times are 00:01 to 12:00 noon. The afternoon times are 12:01 to 24:00 midnight.

**12-Hour Clock**

**24-Hour Clock**







*Example 1:* Change 8:30 PM to 24-hour notation.

To change a PM time to 24-hour notation, add on 12 hours to the 12-hour notation.

$$\begin{array}{rcl}
 8:20 \text{ PM} & \rightarrow & 8:20 \text{ PM} \\
 & & \underline{12:00} \leftarrow \text{Add 12 hours} \\
 & & 20:20
 \end{array}$$

The 24-hour notation for 8:20 PM is 20:20.

*Example 2:* Change 5:30 AM to 24-hour notation.

All that is needed to express a morning time to 24-hour notation is to fill in the first place with a zero for single digit hours.

$$5:30 \text{ AM} \rightarrow 05:30$$

\*Notice that the AM notation is not used in 24-hour clock time.

The 24-hour notation for 5:30 AM is 05:30.

*Example 3:* Change 13:00 to 12-hour notation.

Since 13:00 is greater than 12:00, subtract away 12 hours.

$$\begin{array}{rcl}
 13:00 & \rightarrow & 13:00 \\
 & & - \underline{12:00} \leftarrow \text{Subtract 12 hours} \\
 & & 1:00
 \end{array}$$

Since 13:00 falls in the 12:01 to 24:00 range, we know it is PM.

The 12-hour notation for 13:00 is 1:00 PM.

*Example 4:* Change the following 24-hour notation times to 12-hour notation: (a) 07:00 (b) 11:00

notation. (a) 07:00, (b) 11:00.

All that is needed to express a morning 24-hour time to 12-hour notation is to drop first place zero for single digit hours and add on AM.

07:00 → 7:00 AM

11:15 → 11:15 AM

The 12-hour notation for 07:00 is 7:00 AM.

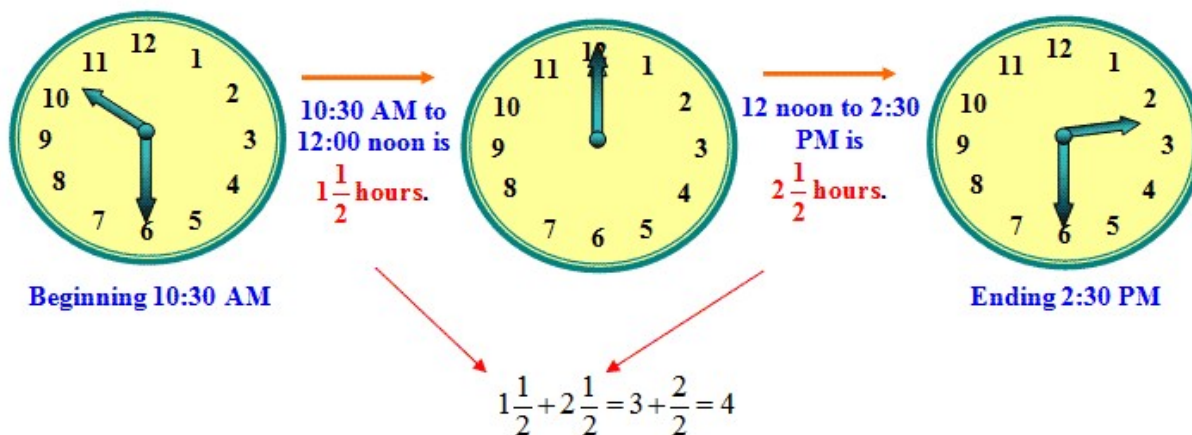
The 12-hour notation for 11:15 is 11:15 AM.

## Elapsed Time

Elapsed time is the amount of time that passes from one time to another.

Note: Remember to watch for AM and PM changes when determining elapsed time.

*Example 5:* Find the elapsed time from 10:30 AM to 2:30 PM



The time elapsed is 4 hours.