

**Apprenticeship Math 12**  
**NOTES: Imperial Measurement**

Name: \_\_\_\_\_

Date: Sept. 21

Only three countries – the U.S., Liberia and Myanmar – still officially stick to the imperial system, which uses distance, weight, height or area measurements that can ultimately be traced back to body parts or everyday items.

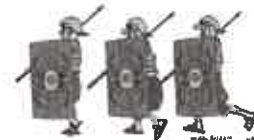
For length measurements, the imperial system uses inches, feet, yards, and miles.

Legend has it that the Greeks developed the “foot” as their fundamental unit of length based on the actual measurement of Hercules’ foot.



People measured a yard of cloth by the distance between the end of the outstretched arm and their chin.

The Romans gave us the inch, which was based on the width of a Roman’s thumb.



The mile was based on the length of a step, about 2.5 feet – 1000 double paces formed a mile.

It is important to be familiar with imperial measurements because they are still used in many areas like construction, and because the United States is so close to Canada.

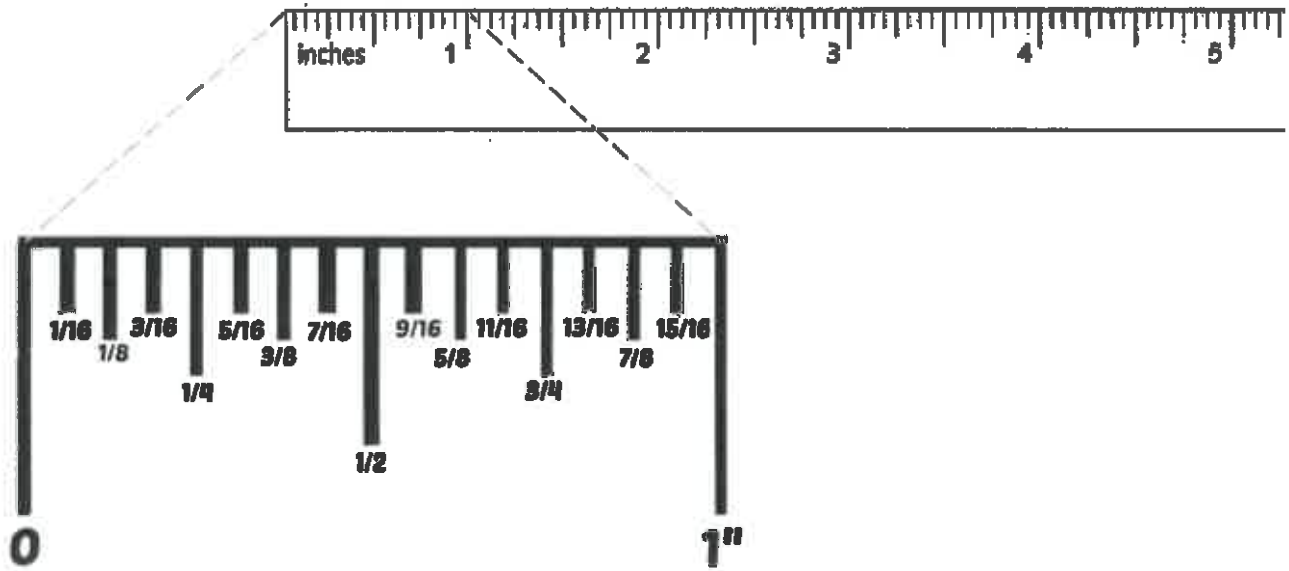
**Common Imperial Units of Length**

*object that we can use to estimate (useful for checking to see if answers are reasonable)*

UNIT	SYMBOL	REFERENT	RELATIONSHIPS
inch	in. or <sup>''</sup>	thumb width	(conversion factors)
foot	ft or <sup>'</sup>	length of foot	1 foot = 12 inches
yard	yd	tip of nose to fingertips of straight arm <sup>(one stride)</sup>	1 yard = 3 feet 1 yard = 36 inches
mile	mi	distance you can walk in 20 min <i>(PGSS to CN Centre)</i>	1 mile = 1760 yards 1 mile = 5280 feet

## Reading an Imperial Ruler or Tape Measure

Tape measures and rulers are usually divided into  $\frac{1}{16}$  of an inch. This means working with fractions!



To measure a length using an imperial ruler, count the whole number of inches, and then count the number of 16<sup>th</sup> of the next inch until the mark is reached. Reduce the fraction part to lowest terms.



$$1 \frac{14}{16} = 1 \frac{7}{8} \text{ in.}$$

*Handwritten notes: 17/8" above the result, and division symbols (÷2) above and below the fraction.*



$$11 \frac{1}{16} \text{ in.}$$

*Handwritten note: 11 1/16" next to the result.*



$$3 \frac{12}{16} = 3 \frac{3}{4} \text{ in.}$$

*Handwritten notes: 3 3/4" below the result, and division symbols (÷4) above and below the fraction.*

## Converting between Imperial Measurements

Use unit analysis or proportional reasoning to convert between various measurements.

Example: Convert  $12\frac{3}{4}$  yd to inches.  $\rightarrow 3 \div 4 = 0.75$   $12\frac{3}{4} = 12.75$

### Unit analysis

Conversion factor:  
(from table)

$$1 \text{ yd} = 36 \text{ in}$$

$$\frac{12.75 \text{ yd}}{1} \times \frac{36 \text{ in}}{1 \text{ yd}} = \frac{12.75 \times 36}{1 \times 1} = 459 \text{ in}$$

### \* Proportion

Conversion factor:  
(from table)

$$1 \text{ yd} = 36 \text{ in}$$

$$\frac{1 \text{ yd}}{36 \text{ in}} = \frac{12.75 \text{ yd}}{x}$$

$$x = 459 \text{ in}$$

Convert the following measurements.

a)  $7.5 \text{ mi} = \underline{\hspace{2cm}} \text{ ft}$

$$1 \text{ mile} = 5280 \text{ ft}$$

$$\frac{1 \text{ mi}}{5280 \text{ ft}} = \frac{7.5 \text{ mi}}{x}$$

$$x = 39600 \text{ ft}$$

b)  $72 \text{ in.} = \underline{\hspace{2cm}} \text{ ft}$

$$1 \text{ foot} = 12 \text{ in}$$

$$\frac{1 \text{ foot}}{12 \text{ in}} = \frac{x}{72 \text{ in}}$$

$$x = 6 \text{ ft}$$

Often Imperial Units are used in combination and we want to convert to (or from) only one unit.

Example: Jan might say she is  $5 \text{ ft } 10. \text{ in}$  tall.

How tall is Jan in inches?

$$1 \text{ ft} = 12 \text{ in.}$$

$$\text{So, } 5 \text{ ft} \times 12 \text{ in.} = 60 \text{ in.}$$

Jan's height in inches is:

$$60 \text{ in.} + 10 \text{ in.} = 70 \text{ in.}$$

How tall is Jan in feet?

$$1 \text{ ft} = 12 \text{ in.}$$

$$\text{So, } 10 \text{ in.} \div 12 \text{ in.} = 0.83 \text{ ft}$$

Jan's height in feet is:

$$5 \text{ ft} + 0.83 \text{ ft} = 5.83 \text{ ft}$$

Convert the following measurements.

a)  $7 \text{ yd } 2 \text{ ft} = \underline{\hspace{2cm}} \text{ ft}$

yd  $\rightarrow$  ft

$$\frac{1 \text{ yard}}{3 \text{ ft}} = \frac{1 \text{ yd}}{x}$$

$$x = 21 \text{ ft.}$$

$$21 + 2 = \boxed{23 \text{ ft}}$$

b)  $3 \text{ yd } 1 \text{ ft} = \underline{\hspace{2cm}} \text{ in.}$

yd  $\rightarrow$  in

$$\frac{1 \text{ yd}}{36 \text{ in}} = \frac{3 \text{ yd}}{x}$$

$$x = 108 \text{ in}$$

ft  $\rightarrow$  in  
1 ft = 12 in

$$108 + 12 = \boxed{120 \text{ in}}$$

c)  $62 \text{ in} = \underline{\hspace{1cm}} \text{ ft } \underline{\hspace{1cm}} \text{ in.}$

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

$$\text{in} \div 12 \rightarrow \text{ft.}$$

$\frac{62}{12} \Rightarrow$   $5 \frac{2}{12}$

5 whole feet  
2 inches ( $\frac{1}{12}$ ths of a foot)

$\boxed{5 \text{ ft } 2 \text{ in}}$

**Example:** A staircase has eight steps that are  $7\frac{1}{4}$  inches high. What is the total height in feet and inches?

Consider the whole numbers first: 7 inches

$$7 \text{ inches} \times 8 = 56 \text{ inches}$$

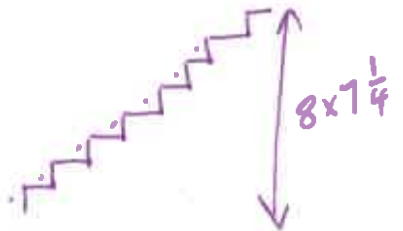
Consider the fraction next:  $\frac{1}{4}$  inches

$$\frac{1}{4} \text{ inches} = \frac{1}{4} \times 8 = 2 \text{ inches}$$

What is the total height?

$$56 \text{ inches} + 2 \text{ inches} = 58 \text{ inches}$$

$$\left. \begin{array}{l} 8 \times 7\frac{1}{4} \\ = \frac{28}{1} \times \frac{29}{4} \\ = 58 \text{ inches} \end{array} \right\}$$



What is this height in feet and inches?

$$58 \text{ inches} \div 12 = 4 \text{ whole feet with a remainder } 10 \text{ inches}$$

So, the height of the staircase is 4 feet 10 inches

$$\frac{58}{12} = 4 \frac{10}{12}$$

feet      inches

$$\boxed{4' 10''}$$