

Chapter 2: Linear Measurement

Name: _____

Imperial System

Heading

The **Imperial System** of measurement or Imperial units is a set of units, with the **foot** being the base unit. The units were introduced in the United Kingdom and the Commonwealth countries, but most of the world now uses the metric system. The exceptions are the United States, Liberia & Myanmar. For measurements of length, the imperial system uses inches, feet, yards, and miles. It is important to be familiar with imperial measurements because they are still used in many areas like construction, and because the United States has many influences in Canada.

Referents are objects used to estimate or visualize the size of common measures.

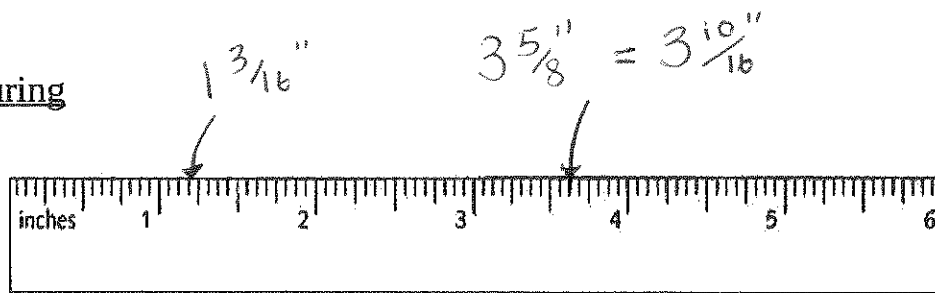
Unit	Referent
Foot	Adult foot
Inch	End of thumb, Diameter of quarter
Yard	Nose to fingertip

Conversion Table (from exam data booklet)

use these to set
up proportions
ex. $\frac{1 \text{ mi}}{1760 \text{ yd}}$

	Common Imperial	Imperial and SI	SI
Length	1 mile = 1760 yards 1 mile = 5280 feet 1 yard = 3 feet 1 yard = 36 inches 1 foot = 12 inches	1 mile $\approx$ 1.609 km 1 yard = 0.9144 m 1 foot = 30.48 cm 1 inch = 2.54 cm	1 km = 1000 m 1 m = 100 cm 1 cm = 10 mm
Mass (Weight)	1 ton = 2000 pounds 1 pound = 16 ounces	2.2 pounds $\approx$ 1 kg 1 pound $\approx$ 454 g 1 ounce $\approx$ 28.35 g	1 t = 1000 kg 1 kg = 1000 g
Volume	1 gallon = 4 quarts 1 gallon (UK) $\approx \frac{6}{5}$ gallons (US) 32 fluid ounces = 1 quart	1.06 quarts (US) $\approx$ 1 L 0.26 gallons (US) $\approx$ 1 L 3.52 fluid ounces (UK) $\approx$ 100 mL 3.38 fluid ounces (US) $\approx$ 100 mL	
Common Abbreviations	mile = mi yard = yd feet = ' or ft inch = " or in ton = tn pound = lb ounce = oz fluid ounce = fl oz		kilometre = km metre = m centimetre = cm millimetre = mm tonne (metric ton) = t gram = g litre = L millilitre = mL

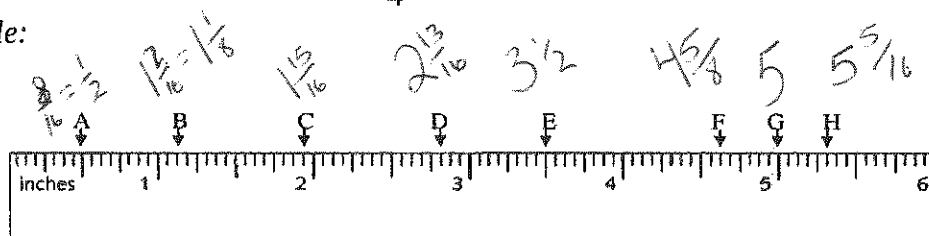
Measuring



This imperial ruler shows inches which are divided into 16^{th} s. Often, rulers show the first inch divided into 32^{nd} of an inch. Each inch on the ruler is marked with a long line and is labelled 1, 2, 3, 4, and so on. In between each inch marker is another long line which marks each half inch. In between each of these divisions is a slightly longer line which marks each quarter ($\frac{1}{4}$) of an inch.

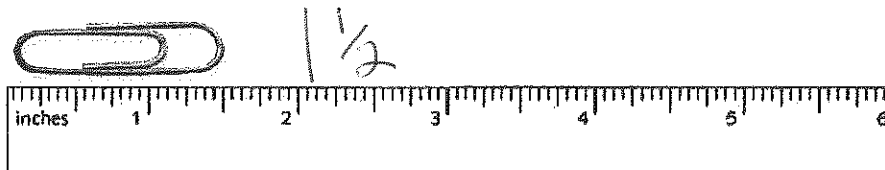
Hint: Fractions represent division, $\frac{1}{4}$ is the same as $1 \div 4 = 0.25$

Example:

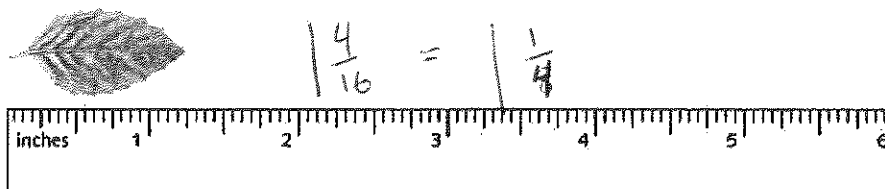


2. Find the length of the objects below to the closest $\frac{1}{16}^{\text{th}}$ of an inch.

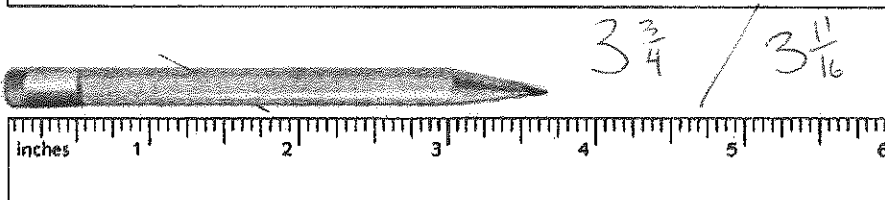
a)



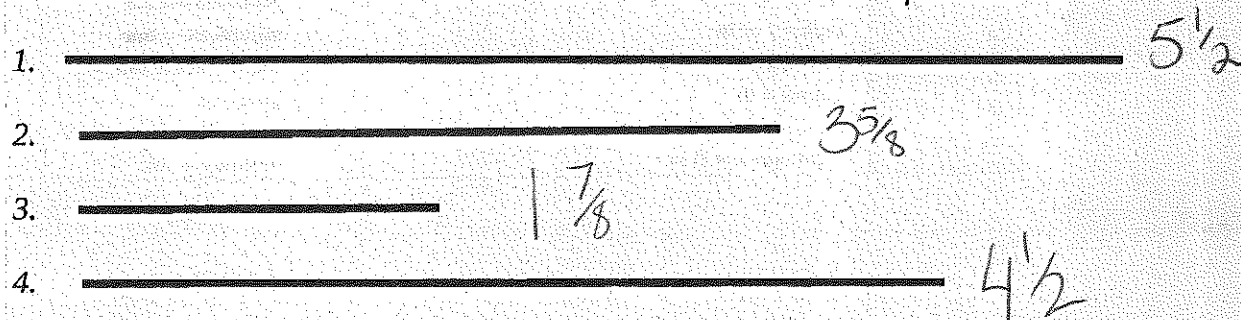
b)



c)



Practice: Use a ruler to measure the lines below to the nearest $\frac{1}{16}^{\text{th}}$ of an inch.



Conversions within the Imperial System

Just like any other conversions a simple way to change from one unit to another is to set up a proportion and solve using "cross multiply & divide"

Example: Convert 135 feet into yards

$$\frac{3 \text{ ft}}{1 \text{ yd}} = \frac{x \text{ yd}}{135 \text{ ft}}$$

$$1 \times 135 \div 3 = 45 \text{ yd}$$

Practice:

1. Convert the following measurements.

a) 38 ft $\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ in}}{38 \text{ ft}}$

$$= \underline{456} \text{ in}$$

b) 0.4 mi $\frac{1 \text{ mi}}{1760 \text{ yd}} = \frac{x \text{ yd}}{0.4 \text{ mi}}$

$$= \underline{704} \text{ yd}$$

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

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

d) 72 in $\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ ft}}{72 \text{ in}}$

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

2. Ray is building a fence around his yard using pre-made panels that are sold in 8 ft lengths. The perimeter of the yard is 32 yd. How many fence panels should he buy?

$$\frac{1 \text{ yd}}{3 \text{ ft}} = \frac{32 \text{ yd}}{x \text{ ft}} = 96 \text{ ft}$$

$$\frac{96 \text{ ft}}{8 \text{ ft/panel}} = \underline{12 \text{ panels}}$$

Imperial units are often used in combination. A person might say they are 5'10" (5 feet plus 10 inches). These need to be converted into only one unit.

Inches only

$$5 \text{ ft} + 10 \text{ in}$$

$$\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ in}}{5 \text{ ft}}$$

$$5 \text{ ft} = 60 \text{ in} + 10 \text{ in} = \underline{70 \text{ in}}$$

Feet only

$$5 \text{ ft} + 10 \text{ in}$$

$$\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ ft}}{10 \text{ in}}$$

$$10 \text{ in} = 0.83 \text{ ft} + 5 \text{ ft} = \underline{5.83 \text{ ft}}$$

Practice: Convert the following measurements.

a) 6 yd 2 ft $\frac{1 \text{ yd}}{3 \text{ ft}} = \frac{6 \text{ yd}}{x \text{ ft}} = 18 + 2$

$$= \underline{20} \text{ ft}$$

b) 3 yd 1 ft $\frac{1 \text{ yd}}{36 \text{ in}} = \frac{3 \text{ yd}}{x \text{ in}} = 108 + 12$

$$= \underline{120} \text{ in}$$

c) 9 yd 11 ft $\frac{1 \text{ yd}}{3 \text{ ft}} = \frac{9 \text{ yd}}{x \text{ ft}} = 27 + 11$

$$= \underline{38} \text{ ft}$$

d) 5 mi 16 yd 2 ft $\frac{1 \text{ mi}}{1760 \text{ yd}} = \frac{5 \text{ mi}}{x \text{ yd}} = 8800 + 16 + 2$

$$= \underline{317400} \text{ in}$$

e) 7 mi 2 yd

$$\frac{1 \text{ mi}}{1760 \text{ yd}} = \frac{7 \text{ mi}}{x \text{ yd}} = 12320 + 2$$

$$= \underline{36966} \text{ ft}$$

