

Unit 1: Measurement

Section 1.1: Imperial Measures of Length

Introduction - Video

http://www.youtube.com/watch?v=DQPQ_q59xyw&feature=player_detailpage



Two main systems of measurement:

- 1) Imperial Units and
- 2) System of Measures (System International)

Imperial System (United States, Australia, Ireland recently converted to Metric(SI))

Imperial Unit	Abbrev.	Referent	Relationship
Inch (smallest)	in.	Thumb length	
Foot	ft.	standard floor tile in classroom	1 ft. = 12 in.
Yard	yd.	Arm span from tip of nose, yard stick, length of a guitar	1yd. = 3ft. = 36 in.
Mile	mi.	Distance walked in 20 minutes, lights to railway crossing	1 mi. = 1760 yd 1 mi. = 5280 ft. (3 x 1760) 1 mi. = _____ in.

(Video on tape measure...stop video and explain the 16ths etc on smart board with pens)

http://www.youtube.com/watch?v=IZ3Ec1p93PA&feature=player_detailpage



Ex) Review....write each as a mixed fraction.

A) $\frac{18}{7} = 2\frac{4}{7}$ why?

B) $\frac{59}{12} = 4\frac{11}{12}$

C) $\frac{31}{12} = 2\frac{7}{12}$

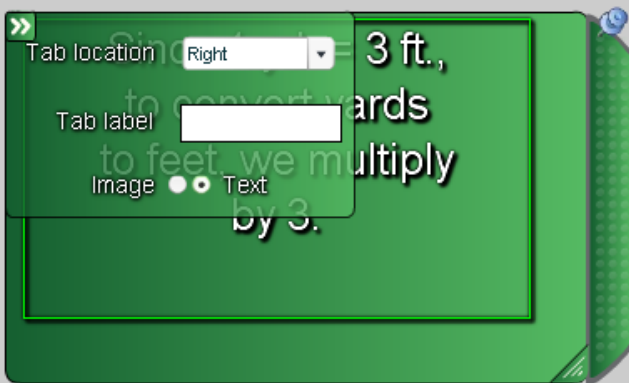
D) $\frac{91}{3} = 30\frac{1}{3}$

E) $\frac{17}{3} = 5\frac{2}{3}$

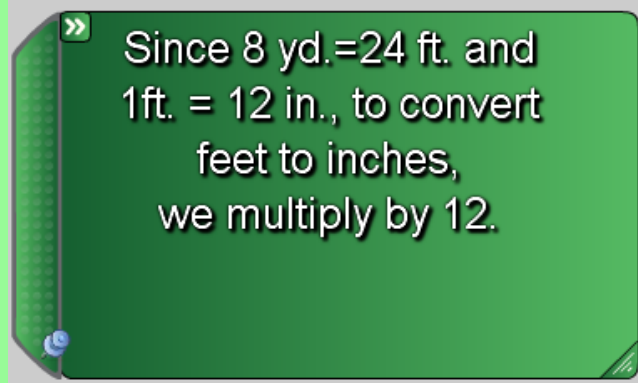
Converting Between Imperial Units

Ex) Convert 8 yards to:

A) feet



$$8 \text{ yd} = 8 \times 3 \text{ ft} = 24 \text{ ft}$$

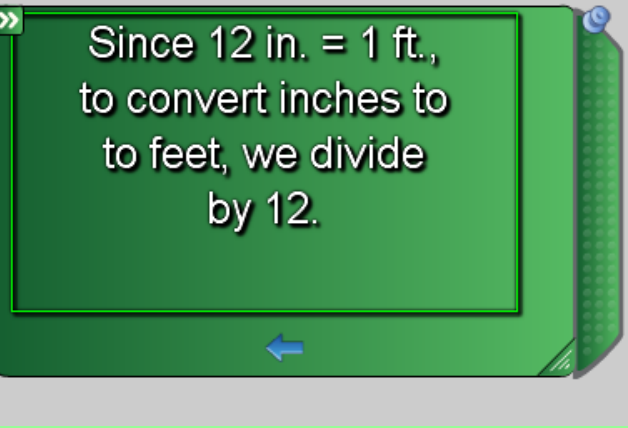


$$\begin{aligned} 8 \text{ yd} &= 24 \text{ ft} \\ 24 \text{ ft} &= 24 \times 12 \text{ in.} \\ 24 \text{ ft} &= 288 \text{ in.} \\ \therefore 8 \text{ yd} &= 288 \text{ in} \end{aligned}$$

Ex) Convert 61 in. to:

A) feet and inches

B) yards, feet, and inches



Since 12 in. = 1 ft.,
to convert inches to
to feet, we divide
by 12.

$$61 \text{ in.} = 5 \text{ ft. } 1 \text{ in.}$$

$$1 \text{ yd.} = 3 \text{ ft.}$$

$$5 \text{ ft.} = 3 + 2 \text{ ft.} = 1 \text{ yd. } 2 \text{ ft.}$$

$$61 \text{ in.} = 5 \text{ ft. } 1 \text{ in.} = 1 \text{ yd. } 2 \text{ ft. } 1 \text{ in.}$$

$$61 \text{ in.} = \frac{61}{12} \text{ ft.}$$

$$61 \text{ in.} = 5 \frac{1}{12} \text{ ft.}$$

$$61 \text{ in.} = 5 \text{ ft. } 1 \text{ in.}$$

Note:

When we convert a measurement from a larger unit to a smaller unit, the number of units increase because we can fit more smaller units into the length than larger units.

ex. 3 yd. = 9 ft.

Therefore,

**To convert from a larger unit to a smaller unit, we multiply.
To convert from a smaller unit to a larger unit, we divide.**

We can also convert measurements using proportions (ratios) or unit analysis.

Ex) Convert the following measurements. NO DECIMALS ALLOWED.

A) 228 inches to yards using a proportion

$$\begin{array}{l} 1 \text{ yd} = 36 \text{ in.} \\ x \text{ yd.} = 228 \text{ in} \end{array} \quad \begin{array}{l} \frac{1}{36} = \frac{x}{228} \\ \frac{36x}{36} = \frac{228}{36} \end{array} \rightarrow \begin{array}{l} x = 6 \frac{12}{36} \text{ yd} \\ x = 6 \frac{1}{3} \text{ yd} \\ x = 6 \text{ yd. } 1 \text{ ft.} \end{array}$$

B) 51 feet to inches using unit analysis

We can write the relationship between feet and inches as a fraction in 2 ways:

$$\frac{1 \text{ ft.}}{12 \text{ in.}} \text{ and } \frac{12 \text{ in.}}{1 \text{ ft.}} \quad \text{These are called } \textit{conversion factors}.$$

$$51 \cancel{\text{ft}} \times \frac{12 \text{ in.}}{1 \cancel{\text{ft.}}} = 612 \text{ in}$$

C) 27 yards to feet using a proportion

$$\begin{array}{l} 1 \text{ yd} = 3 \text{ ft} \\ 27 \text{ yd} = x \text{ ft} \end{array} \quad \begin{array}{l} \frac{1}{3} = \frac{27}{x} \\ x = 81 \text{ ft} \end{array}$$

D) 29 920 yards to miles using unit analysis

$$29\,920 \text{ yd} \times \frac{1 \text{ mi.}}{1760 \text{ yd.}} = 17 \text{ mi.}$$

Video on Unit Analysis

<http://www.youtube.com/watch?v=XKCZn5MLKvk>



Ex) Convert the following measurements. NO DECIMALS ALLOWED

A) 7 feet 9 inches to inches

$$\cancel{7ft} \times \frac{12in}{\cancel{1ft}} = 84in$$

$$7ft. 9in = 84in + 9in. \\ = 93in.$$

B) 428 feet to yards and feet

$$428\cancel{ft} \times \frac{1yd}{\cancel{3ft}} = 142\frac{2}{3}yd = 142yd \ 2ft.$$

C) 6890 feet to miles, yards and feet

$$\frac{6890ft}{5280ft/mile} = 1\frac{1610}{5280} \text{ mile} = 1mi. \ 1610ft$$

$$\frac{1610ft}{3ft/yd} = 536\frac{2}{3}yd$$

$$= 536yd \ 2ft$$

$$6890ft = 1mi \ 536yd \ 2ft$$

D) 35 feet 7 in to yards, feet and inches

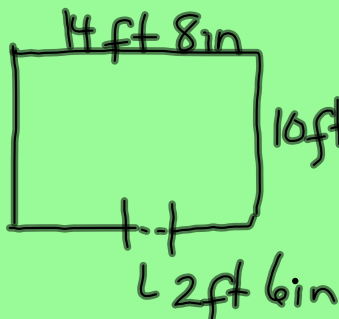
$$\frac{35ft}{3ft/yd} = 11\frac{2}{3}yd$$

$$= 11yd \ 2ft$$

$$35ft. 7in = 11yd. 2ft. 7in$$

Ex) Alice is putting a border around the walls of a rectangular rec room with dimensions 14 ft. 8 in. by 10 ft. 3 in. half way up the wall. The room has one door and its width is 2 ft. 6 in.

A) What is the total length of border needed?



$$P = 2l + 2w$$

$$P = 2(14\text{ft} \cdot 8\text{in}) + 2(10\text{ft} \cdot 3\text{in})$$

$$P = \underline{28\text{ft}} \cdot 16\text{in} + \underline{20\text{ft}} \cdot 6\text{in}$$

$$P = 48\text{ft} \cdot 22\text{in}$$

$$* \frac{22\text{in}}{12\text{in}/\text{ft}} = 1 \frac{10}{12}\text{ft}$$

$$= 1\text{ft} \ 10\text{in}$$

$$P = 48\text{ft} + 1\text{ft} \cdot 10\text{in}$$

$$P = 49\text{ft} \cdot 10\text{in}$$

$$\begin{aligned} \text{Border} &= 49\text{ft} \cdot 10\text{in} - 2\text{ft} \cdot 6\text{in} \\ &= 47\text{ft} \cdot 4\text{in} \end{aligned}$$

B) If the border is sold in 96 in. strips, and sells for \$4.89 per strip, determine the total cost of the border needed.

$$47\text{ft} \times \frac{12\text{in}}{\text{ft}} = 564\text{in}$$

$$\therefore \text{total length} = 564\text{in} + 4\text{in} = 568\text{in}$$

$$\# \text{strips} = \frac{568\text{in}}{96\text{in}} = 5.9 = 6$$

$$\text{Cost} = 6 \times \$4.89 = \$29.34$$

Ex) The school has 20 yds fabric that will be cut into 7 inch strips to make banners for a sports meet.

A) How many banners can be made?

7 in. 20 yd.



$$20 \text{ yd.} = 20 (3 \text{ ft.}) = 60 \text{ ft.}$$

$$1 \text{ ft.} = 12 \text{ in.} \quad \text{Therefore,}$$

$$60 \text{ ft.} = 60 (12 \text{ in.}) = 720 \text{ in}$$

or

$$20 \text{ yd} \times \frac{36 \text{ in}}{\text{yd}} = 720 \text{ in}$$

the number of banners are: $720/7 = 102.9$ (102 full banners can be made)

B) Use unit analysis to confirm:

$$20 \cancel{\text{yd.}} \times \frac{3 \cancel{\text{ft.}}}{1 \cancel{\text{yd.}}} \times \frac{12 \cancel{\text{in.}}}{1 \cancel{\text{ft.}}} =$$

$$= 720$$

Pull

Ex) A student can walk 80 ft. in 15s. How far can she walk in 1 hour?

$$1 \text{ hour} = 60 \text{ min} = 60 \text{ s} * 60 \text{ min} = 3600 \text{ s}$$

$$\frac{3600}{15} = 240 \text{ (15 s time units)}$$

$$\text{In 1 hour she will walk } 240 \times 80 = 19,200 \text{ ft}$$

$$1 \text{ mi.} = 5280 \text{ ft.}$$

$$\frac{x}{19,200 \text{ ft.}} = \frac{1 \text{ (mi.)}}{5280 \text{ (ft.)}}$$

$$x = 3 \frac{3360}{5280} \dots 3 \text{ miles} \dots 3360 \text{ ft.} = 3 \text{ miles } 1120 \text{ yds.}$$

Assign: Page 11 3, 4, 5, 7, 8, 9, 10, 11, 14, 15 (Not all at once)