

Conversion Problems

Converting *units* of measure.



Conversion Cal

Q/K=q/k Conversion (See Proportion Problems)

How many feet are in 30 inches?

Equation: $\frac{Q \text{ feet}}{30 \text{ inch}} = \frac{1 \text{ foot}}{12 \text{ inch}}$

$$\frac{Q \text{ feet}}{30 \text{ inch}} = \frac{1 \text{ foot}}{12 \text{ inch}} \quad \frac{30 \text{ inch}}{12 \text{ inch}} = 2.5$$

Q = 2.5 feet

Rack-to-Deck
(See Fraction Fun)

$$\begin{array}{r} 30 \\ 12 \overline{) 30.0} \\ \underline{24} \\ 60 \\ \underline{60} \\ 0 \end{array}$$

Q/K=q/k is the parent of Conversion problems, but the following direct conversion techniques can be quicker and more efficient.

Conversion Twin Magic Hat Trick

How many feet are in 30 inches?

Computation: 30 in = 30 (1 in) = 30 (1/12 ft)

| | |
|---------------------|--|
| 30 in | Start with units to be converted. |
| 30 (1 in) | Place the #1 (unit) Twin in a parentheses "hat." |
| 30 (1/12 ft) | Tap your wand on the "hat" to magically turn the #1 Twin into its equivalent twin. |
| 2.5 ft | Multiply to obtain the converted value. |

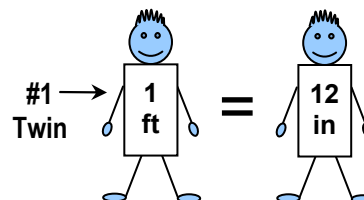
Abbreviations
in: inch, inches
ft: foot, feet
mi: mile, miles

Conversion Twins

Identical twins with equivalent values but different "names."

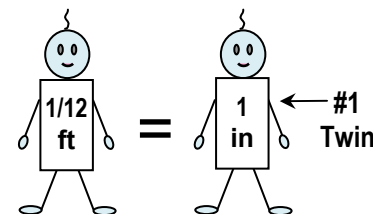
Senior Twins

The standard equivalents



Junior Twins

The opposite equivalents

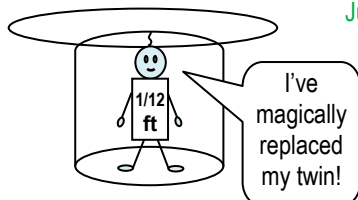
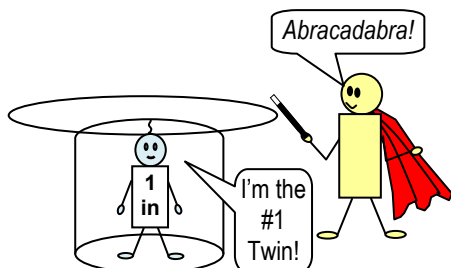


To derive opposites, divide both twins by the other's value.

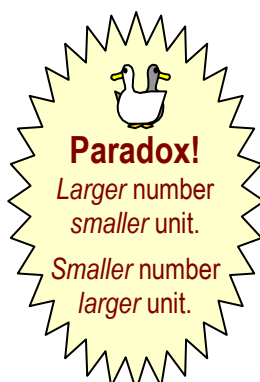
$$1 \text{ ft} = 12 \text{ in}$$

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

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

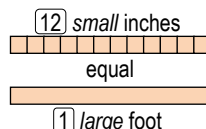


The Magic Hat Trick works best when the given unit matches the Senior #1 Twin. If not (as in this problem), you must know or derive the opposite Junior #1 Twin.



Why?

It takes several smaller units to equal a larger unit.



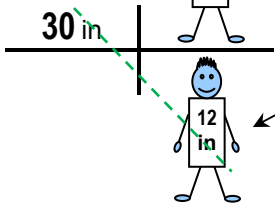
Conversion Twin Stack Attack

How many feet are in 30 inches?

Computation: $\frac{30 \text{ in} \mid 1 \text{ ft}}{12 \text{ in}}$ ← Fraction Fence (divide vertically, multiply across)

$$\frac{30 \text{ in} \mid 1 \text{ ft}}{12 \text{ in}} = 2.5 \text{ ft}$$

1. Start with units to convert



2. Stack the Twins

Top Twin
The desired ending unit

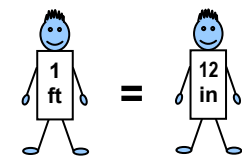
Bottom Twin
The unit to be dissolved

3. Do the Math

The Stack Attack can be more efficient than the Magic Hat Trick, because there is no need to derive the opposite twins.

Why It Works
Dividing equivalent twins yields 1. Multiplying by 1 does not change the underlying value, only the number and unit.

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



To convert in the opposite direction, flip the Stack.

How many inches are in 2.5 feet?

$$\frac{2.5 \text{ ft} \mid 12 \text{ in}}{1 \text{ ft}} = 30 \text{ in}$$

Flipped Twin Stack.

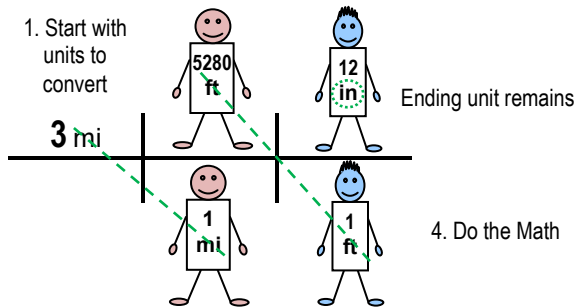
Conversion Twin Chain (3 or more units of measure)

How many inches are in 3 miles?

Computation: $\frac{3 \text{ mi} \mid 5280 \text{ ft} \mid 12 \text{ in}}{1 \text{ mi} \mid 1 \text{ ft}}$ ← Extended Fraction Fence

$$\frac{3 \text{ mi} \mid 5280 \text{ ft} \mid 12 \text{ in}}{1 \text{ mi} \mid 1 \text{ ft}} = 190,080 \text{ in}$$

1. Start with units to convert

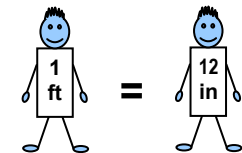


Ending unit remains

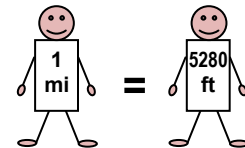
2. Stack to dissolve starting unit

3. Stack to dissolve preceding top unit

4. Do the Math



Conversion Chains require multiple twins to stack.



To find lists of equivalent twins, look in a dictionary under "Measures."



Your Turn



Circle the smaller unit.

- 100 cm = 1 meter
- 1 liter = 1.05 qt
- 28 g = 1 oz
- 1 kg = 2.2 lb
- 14 lb = 1 stone*

Abbreviations

| | |
|----|------------|
| cm | centimeter |
| g | gram |
| kg | kilogram |
| lb | pound |
| oz | ounce |
| qt | quart |

* In the British Isles, some people still measure their personal weight in "stones."
A person who is "10 stone 4" weighs
(10×14 lb + 4 lb =) 144 lbs.

True / False

- When stacking twins, place the unit you want to remove in the denominator.
- The Twin Stack Attack eliminates the need to derive opposite twins.
- When comparing twins, the larger unit has the larger number.

Liquid Measures

| | | |
|-------|---|--------|
| 1 cup | = | 8 oz |
| 1 qt | = | 4 cups |
| 1 gal | = | 4 qt |

Convert using the Magic Hat Trick.

- How many ounces are in 6 cups?
- How many cups are in 64 ounces?

Convert using the Twin Stack Attack.

- How many ounces are in 12 cups?
- How many cups are in 128 ounces?

Convert using the Conversion Twin Chain.

- How many cups are in 1 gallon?
- How many ounces are in 2 gallons?

Answers: [1] cm, [2] qt, [3] g, [4] lb, [5] lb, [6] T, [7] T, [8] F, [9] 48 oz, [10] 8 cup, [11] 96 oz, [12] 16 cups, [13] 16 cups, [14] 256 oz.