**Converting Measurements Using Ratio**

The concept of “ratio” and “proportion” are very helpful in converting measurements. These measurements include **customary units** such as feet, yard, inches, etc., and **metric units** such as meter, centimeter, millimeter, etc.



1m = 100cm = 1000mm

**Table of Conversion**

Refer to table to convert one unit to another.

|  |
| --- |
| Customary Units |
| Length | Weight | Capacity |
| 1 foot = 12 inches1 yard = 3 feet1 mile = 1760 yards | 1 pound = 16 ounces1 ton = 2000 pounds | 1 cup = 8 fluid ounces1 pint = 2 cups1 quart = 2 pints1 gallon = 4 quarts |
| Metric Measurements |
| Length | Mass | Capacity |
| 1 kilometer = 1000 meters1 meter = 100 centimeters1 centimeter = 10 millimeters | 1 kilogram = 1000 grams1 gram = 1000 milligrams | 1 liter = 1000 milliliters |

**Conversion Rules Using RATIO**

Example: How many gallons is equivalent to 40 quarts?

Rule 1: Determine the measurement or any information that you need to create a ratio.

Measurements involved: **gallon and quarts**

Ratio: $\frac{1 gallon}{4 quarts}$

Rule 2: Go back to the problem and set up an equivalent ratio. Take note that it is important to include the units to avoid confusion.

This information is given in the problem. Be careful to set up the ratio properly so the units match up!!!



Rule 3: Multiply or divide to find what you’re looking for.

 Cross multiply the values.



4*x* = 40

 *X* = 10 Therefore, there are 10 gallons in 40 quarts.

Finding the scale factor can also help.



 $\frac{1 gallon ×10 }{4 quarts ×10}= \frac{10 gallons}{40 quarts}$

**Sample Problem 1:**

How many feet is 72 inches?

**Converting Measurements Using A Conversion Factor**

Consider the previous example “How many gallons is equivalent to 40 quarts?” with its conversion factor 4 quarts = 1 gallon, if we treat it as an equation and divide both sides by 4 quarts…here’s what we get.

$$\frac{4 quarts}{4 quarts}=\frac{1 gallon}{4 quarts}$$

Cancelling ***4 quarts*** gives us “1” on the left side of the equation and a ratio of **1 gallon is to 4 quarts** on the right side.

$$1= \frac{1 gallon}{4 quarts}$$

Now, we can go back to the problem…

**How many gallons is equivalent to 40 quarts?**

Rule 1: Multiply the unit we want to convert by 1. Remember that anything multiplied by 1 will never change its value.

 **40 quarts x 1**

Rule 2: Replace “1” with the ratio that we obtained using the conversion factor. In this case, since $1=\frac{1 gallon}{4 quarts}$ , we’ll replace **1** by the ratio $\frac{1 gallon}{4 quarts}$**.**

 **40 quarts x** $\frac{1 gallon}{4 quarts}$

Rule 3: Cross out the measuring units that can be cancelled out

 **40 quarts x** $\frac{1 gallon}{4 quarts}$

Rule 4: Multiply or divide the remaining values

 $\frac{40 x 1 gallon}{4}$ **= 10 gallons**

**Sample Problem 2:**

How many feet does 132 inches have?

Use the conversion factor: 1 feet = 12 inches

**Solving Word Problems Using Raito to Convert Units**

The methods above can be used to solve problems involving unit conversions.

Example:

Matt rode 4 kilometers on his bike while his sister rode 6,000 meters. Who rode the farthest (in kilometers)?

**Solution:**

Since the problem requires us an answer in kilometers, we will convert the distance traveled by Matt’s sister in kilometers. We know that 1 kilometer = 1000 meters.

Rule 1: $\frac{1 kilometer}{1000 meters}$

Rule 2: $\frac{1 kilometer}{1000 meters}= \frac{x kilometers}{6000 meters}$

Rule 3: 1000x = 6000

x = 6 kilometers, therefore Matt’s sister travelled the farthest.

**Sample Problem 3:**

Sam is cutting a piece of rope that measures 70 cm. Jenny is cutting a piece of rope that measures 900 mm. How long are the two pieces of ropes combined together in centimeters?