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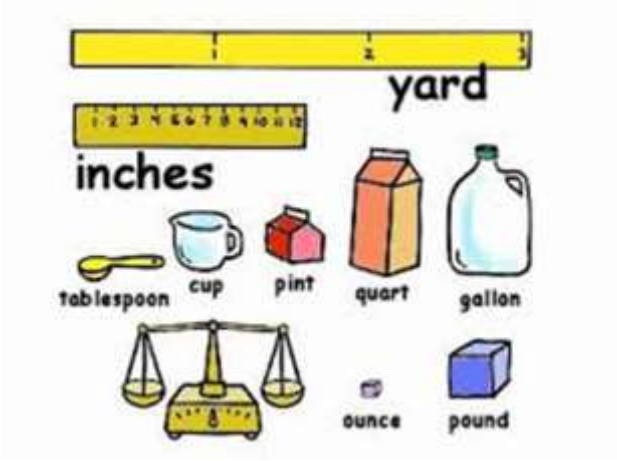
# Ratio and Measurement Units Guide Notes

## 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

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## Table of Conversion

Refer to table to convert one unit to another.

| Customary Units | | |
|---|---|---|
| **Length** | **Weight** | **Capacity** |
| 1 foot = 12 inches<br>1 yard = 3 feet<br>1 mile = 1760 yards | 1 pound = 16 ounces<br>1 ton = 2000 pounds | 1 cup = 8 fluid ounces<br>1 pint = 2 cups<br>1 quart = 2 pints<br>1 gallon = 4 quarts |
| **Metric Measurements** | | |
| **Length** | **Mass** | **Capacity** |
| 1 kilometer = 1000 meters<br>1 meter = 100 centimeters<br>1 centimeter = 10 millimeters | 1 kilogram = 1000 grams<br>1 grams = 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: $\frac{1\ gallon}{4\ quarts}$

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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.

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

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.

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

$4x = 40$

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

Finding the scale factor can also help.

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

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

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# Ratio and Measurement Units Guide Notes

## Sample Problem 1:

How many feet is 72 inches?

Solution:

Rule 1: $\frac{1\ foot}{12\ inches}$

Rule 2: $\frac{1\ foot}{12\ inches} = \frac{x\ foot}{72\ inches}$

Rule 3: $12x = 72$

$x = 6$

Therefore, 72 inches has 6 feet.

## 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.

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

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# Ratio and Measurement Units Guide Notes

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

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

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# Ratio and Measurement Units Guide Notes

## Sample Problem 2:

How many feet does 132 inches have?

Use the conversion factor: 1 feet = 12 inches

Solution:

$$\frac{1\ feet}{12\ inches} = \frac{12\ inches}{12\ inches}$$

$$\frac{1\ feet}{12\ inches} = 1$$

Rule 1: 132 inches x 1

Rule 2: 132 inches x $\frac{1\ feet}{12\ inches}$

Rule 3: 132 ~~inches~~ x $\frac{1\ feet}{12\ \cancel{inches}}$

Rule 4: $\frac{132 \text{ x } 1\ feet}{12}$ = **11 feet**

## 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)?

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**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?

Solution: We know that 1 centimeter = 10 millimeters.

Rule 1: $\frac{1\ centimeter}{10\ millimeters}$

Rule 2: $\frac{1\ centimeter}{10\ millimeters} = \frac{x\ cenitmeters}{900\ millimeters}$

Rule 3: 10x = 900

x = 90 cm, Jenny's rope is 90 cm.

Adding the two pieces of rope gives us 70 cm + 90 cm = 160cm