

Ratios, Rates, and Conversions Guided Notes

What is a Ratio?

A ratio is a comparison of a number ***a*** and a non-zero number ***b*** using division.

There are three different ways of writing a ratio:

$$\frac{a}{b}$$

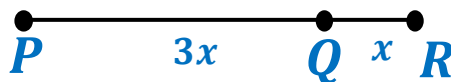
$$a : b$$

$$a \text{ to } b$$

The ratio is written in simplest form and can be simplified if the quantity in the numerator and denominator is of same units.

$$4\text{ft}:6\text{ft} \rightarrow \frac{4\text{ft}}{6\text{ft}} \rightarrow \frac{2\text{ft}}{3\text{ft}} \rightarrow 2\text{ft}:3\text{ft}$$

Problem 1: In the figure below, $PQ : QR$ is $3 : 1$. Find the values of PQ and QR if $PR = 28$.



Let x be the length of QR . Since the ratio of PQ to QR is $3 : 1$, we can write $3x : x$.

$$\rightarrow 3x + x = 28 \quad \text{By Segment Addition postulate } PQ + QR = PR$$

$$\rightarrow 4x = 28 \rightarrow x = 7$$

$$\rightarrow QR = x = 7$$

$$\rightarrow PQ = 3x = 3 \times 7 \rightarrow PQ = 21$$

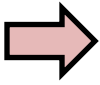
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Rate

It is a comparison of two numbers with different units using division.

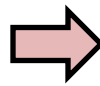
Example:

• 2000 miles per 20 hours 
$$\frac{2000 \text{ miles}}{20 \text{ hours}}$$

Unit Rate

It is the rate having 1 as the denominator.

Example:

2000 miles per 20 hours, so in 1 hour, $\frac{2000 \text{ miles}}{20 \text{ hours}}$ 
$$\frac{100 \text{ miles}}{1 \text{ hour}}$$

Problem 2: Two shops are selling T-shirts in deals (given below). Which shop is offering the best deal?

Shop 1: 3 T-shirts for 27\$

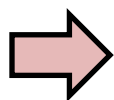
Shop 2: 4 T-shirts for 20\$

**Find the unit Rate
of each T-shirt**

$$\frac{27\$}{3 \text{ T-shirts}} = 9\$ \text{ per T-shirt}$$

**Find the unit Rate
of each T-shirt**

$$\frac{20\$}{4 \text{ T-shirts}} = 5\$ \text{ per T-shirt}$$



$$5\$ < 9\$$$

So, Shop 2 has the best deal.

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Conversion of Units

Conversion of units means converting from one unit of measurement to another using a pre-defined conversion factor.

Conversion Factor:

It is a ratio of two equivalent measures in different units. It is always equal to 1.

Example:

$$\frac{1ft}{12 inches} \Rightarrow 1ft = 12 inches$$

- When going from larger to smaller unit, we multiply with the conversion factor.
- When going from smaller to larger unit, we divide with the conversion factor.

Different Conversion of Units

Length:

$$12 inches = 1 foot$$

$$3 feet = 1 yard$$

$$5280 feet = 1 mile$$

Capacity:

$$8 ounces = 1 cup$$

$$2 cups = 1 pint$$

$$2 pints = 1 quart$$

$$4 quarts = 1 gallon$$

Weight:

$$16 ounces = 1 pound$$

$$2000 pounds = 1 ton$$

Time:

$$60 seconds = 1 minute$$

$$60 minutes = 1 hour$$

$$24 hours = 1 day$$

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Problem 3: Convert 36 inches to yards.

First we will convert 36 inches to feet. Since foot is greater than inches, we will divide with the conversion factor:

$$36 \text{ inches} \times \frac{1 \text{ foot}}{12 \text{ inches}} \Rightarrow 3 \text{ feet}$$

Now we will convert 3 feet to yards. Since yard is greater than foot, we will divide with the conversion factor:

$$3 \text{ feet} \times \frac{1 \text{ yard}}{3 \text{ feet}} \Rightarrow 1 \text{ yard}$$