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Ratios, Rates, and Conversions

Unit 2 Lesson 6

RATIOS, RATES, AND CONVERSIONS

Students will be able to:

Understand the concept of Ratios, Rates, Unit Rates
and Conversions between different Units

Key Vocabulary:

- Ratio
- Rate, Unit Rate
- Conversions

RATIOS, RATES, AND CONVERSIONS

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.

$$4ft:6ft \Rightarrow \frac{4ft}{6ft} \Rightarrow \frac{2ft}{3ft} \Rightarrow 2ft:3ft$$

RATIOS, RATES, AND CONVERSIONS

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 $3x : x$.

➡ $3x + x = 28$ By Segment Addition postulate $PQ + QR = PR$

➡ $4x = 28$ ➡ $x = 7$

➡ $QR = x = 7$

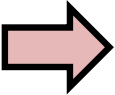
➡ $PQ = 3x = 3 \times 7$ ➡ $PQ = 21$

RATIOS, RATES, AND CONVERSIONS

Rate

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

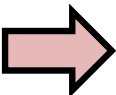
Example:

- 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, $\frac{2000 \text{ miles}}{20 \text{ hours}}$ 
$$\frac{100 \text{ miles}}{1 \text{ hour}}$$

RATIOS, RATES, AND CONVERSIONS

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\$

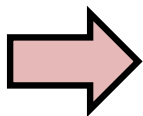
Shop 2: 4 T-shirts for 20\$

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.

RATIOS, RATES, AND CONVERSIONS

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.

RATIOS, RATES, AND CONVERSIONS

Different Conversion of Units

Length:

12 inches = 1 foot

3 feet = 1 yard

Capacity:

8 ounces = 1 cup

2 cups = 1 pint

Weight:

16 ounces = 1 pound

2000 pounds = 1 ton

Time:

60 seconds = 1 minute

60 minutes = 1 hour

24 hours = 1 day



RATIOS, RATES, AND CONVERSIONS

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 yards is greater than foot, we will divide with the conversion factor:

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