Objective: TSWBAT find solutions to problems using unit rate and unit analysis

Vocabulary

1. ratio - compares two numbers using division
2. rate - a ratio that compares quantities measured in different units
3. unit rate - a rate with a denominator of one unit
4. unit analysis - (or dimensional analysis) - when the units for each quantity are included in the calculations to help determine the units for the answers.

Problem 1 Comparing Unit Rates

Shopping You are shopping for T-shirts. Which store offers the best deal?

Store A: $25 for 2 shirts **Store B: $45 for 4 shirts** **Store C: $30 for 3 shirts**

Write each price as a ratio. Then write the ratio as a unit rate to compare.

Store A

$\frac{\$25}{2 \text{ shirts}} \times \frac{N}{1 \text{ shirt}}$

Store B

$\frac{\$45}{4 \text{ shirts}} \times \frac{N}{1 \text{ shirt}}$

Store C

$\frac{\$30}{3 \text{ shirts}} \times \frac{N}{1 \text{ shirt}}$

the best deal because its unit rate is the lowest.

Cross Multiply Then Divide

$\frac{2N = 25}{2 \quad 2}$

$N = 12.50$

$\frac{4N = 45}{4 \quad 4}$

$N = 11.25$

$\frac{3N = 30}{3 \quad 3}$

$N = 10$

Got It? 1. If Store B lowers its price to $42 for 4 shirts, does the solution to Problem 1 change? Explain.

$\frac{\$42}{4} = \frac{N}{1}$

$4N = 42$

$N = \$10.50$

Problem 2 Converting Units

What is the given amount converted to the given units?

Choose and multiply by the appropriate conversion factor. The appropriate factor will allow you to divide out the common units and simplify.

A 330 min; hours

$330\text{min} \times \frac{1\text{hr}}{60\text{min}} = 5.5\text{hrs}$

B 15 kg; grams

$15\text{kg} \times \frac{1000\text{g}}{1\text{kg}} = 15{,}000\text{g}$

C 5 ft 3 in.; inches

$5\text{ft} \times \frac{12\text{in}}{1\text{ft}} = 60\text{in} + 3\text{in}$

63in

Got It? 2. What is 1250 cm converted to meters?

$1250\text{cm} \times \frac{1\text{m}}{100\text{cm}} = 12.5\text{m}$

Problem 3 Converting Units Between Systems STEM

Architecture **The CN Tower in Toronto, Canada, is about 1815 ft tall. About how many meters tall is the tower? Use the fact that 1 m ≈ 3.28 ft.**

Multiply by the appropriate conversion factor and divide out common units.

$$1815\,\text{ft} \times \frac{1\,\text{m}}{3.28\,\text{ft}} = 553.4\,\text{m}$$

Got It? **3. a.** A building is 1450 ft tall. How many meters tall is the building? Use the fact that 1 m ≈ 3.28 ft.

b. Monetary exchange rates change from day to day. On a particular day, the exchange rate for dollars to euros was about 1 dollar = 0.63 euro. About how many euros could you get for $325 on that day?

(a) $1450\,\text{ft} \times \frac{1\,\text{m}}{3.28\,\text{ft}} = 442.1\,\text{m}$

(b) $\$325 \times \frac{0.63\,\text{e}}{\$1} = 204.75\,\text{euros}$

Problem 4 Converting Rates

A student ran the 50-yd dash in 5.8 s. At what speed did the student run in miles per hour? Round your answer to the nearest tenth.

$$\frac{50\text{ yds}}{5.8\text{ s}} \times \frac{3600\text{ s}}{1\text{ hr}} \times \frac{3\text{ FT}}{1\text{ yd}} \times \frac{1\text{ mile}}{5280\text{ FT}} = 17.6\ \frac{\text{miles}}{\text{hr}}$$

Got It? **4. a.** An athlete ran a sprint of 100 ft in 3.1 s. At what speed was the athlete running in miles per hour? Round to the nearest mile per hour.

b. Reasoning In Problem 4, one student multiplied by the conversion factors $\frac{1\text{ mi}}{1760\text{ yd}}$, $\frac{60\text{ s}}{1\text{ min}}$, and $\frac{60\text{ min}}{1\text{ h}}$ to find the speed. Can this method work? Why or why not?

$$\frac{100\text{ FT}}{3.1\text{ s}} \times \frac{1\text{ mile}}{5280\text{ FT}} \times \frac{3600\text{ s}}{1\text{ hr}} = 21.99\ \text{m/hr}$$